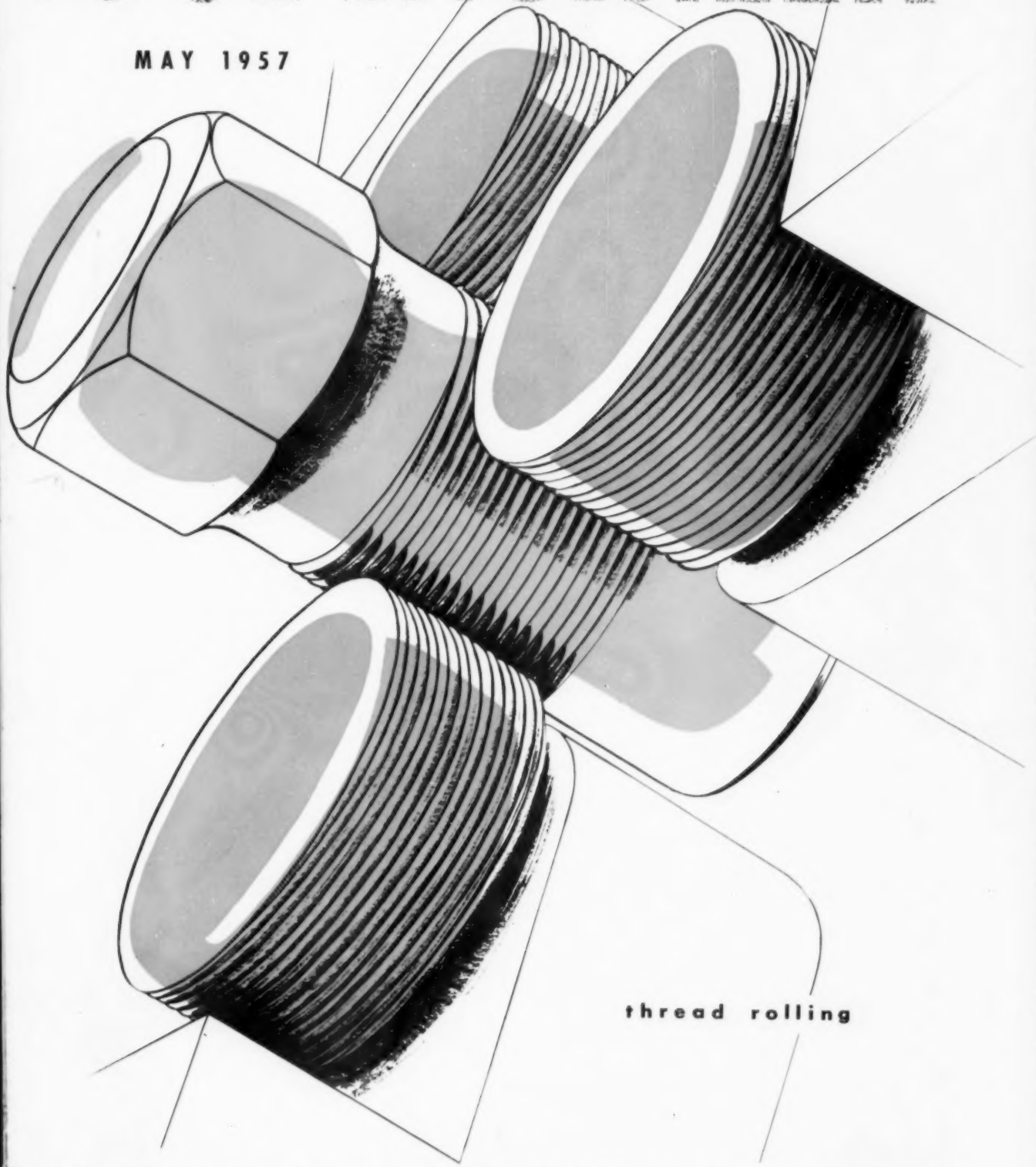
THE

TOOL ENGINEER

MAY 1957



thread rolling

PUBLICATION OF THE AMERICAN SOCIETY OF TOOL ENGINEERS

How to get TOP PRECISION PRODUCTION from your Heald Bore-Matics

Sharpen your tools with Heald Precision on a Model 3 Tool Sharpener

HERE, in the plant of a large and progressive automotive manufacturer, is a "production line" for producing *precision production!* These Heald Model 3 Tool Sharpeners serve the cutting tools for a host of Heald Bore-Matics and other precision finishing machines throughout the plant.

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Cover: Rolled threads have superior surface finishes, can be made to close tolerances and can be produced in a variety of forms. The thread rolling process lends itself to automatic production. These advantages are discussed in an article beginning on page 87. All types of thread rolling tools are also described.

The Tool Engineer

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PLANNING · ENGINEERING · CONTROL · TOOLING · EQUIPMENT · PRODUCTION

THE TOOL ENGINEER is regularly indexed in the *Engineering Index Service* and the *Industrial Arts Index*

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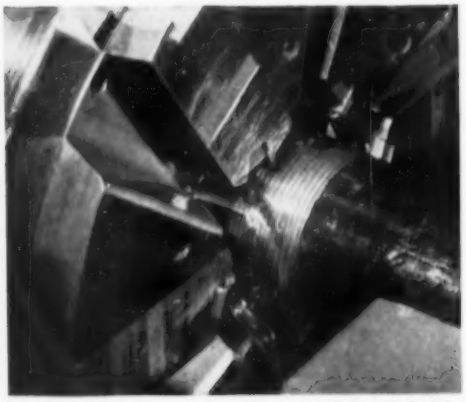

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The Tool Engineer

Invest in Yourself

Nowhere can greater dividends be paid than those received from investment in yourself. Time spent in professional development will continue to pay dividends in many forms. Americans are prone to invest in life insurance and the markets but generally neglect to invest in time to improve themselves mentally. Eight hours are devoted to work but leisure time is usually spent with little or no direction. Many cultivate the full potentials of business but ignore their individual potentials.

Much has been said about increased engineering shortages; little has been said about how to effectively use the talent we have. Still less has been said about the penalty we are beginning to pay for the "education-by-fun era," practiced particularly in the public schools during the past two decades by our "progressive" educators. That crop of students is now getting into industry. Engineering, however, never was learned without diligent application and work. Any fun was a related by-product associated with the satisfaction of accomplishment.

Without question, the student exposed to the fun theory of education seldom became a candidate for engineering. He never developed the necessary background unless it was in spite of his primary and secondary education.

The fact that engineering shortages continue should not in itself discourage any engineer. It gives him the opportunity to be more useful to his community and more respected as a professional. It also provides the opportunity to delegate performance of routine work to technicians, freeing him for creative work and engineering decisions.

In investing time for self-improvement, the engineer should carefully plan and allocate his time to best advantage. The goal of being a better engineer each day can be reached through many channels. Self-study, study at universities and participation in society activities are ways to make effective use of time. Other subjects, in addition to engineering, should be studied. Finance, economics, psychology, law and English are basic tools for the engineer.

John W Greve

EDITOR

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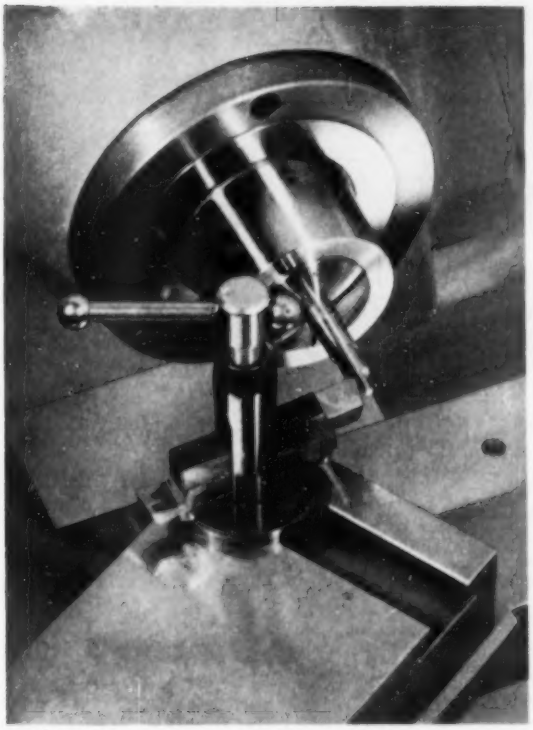

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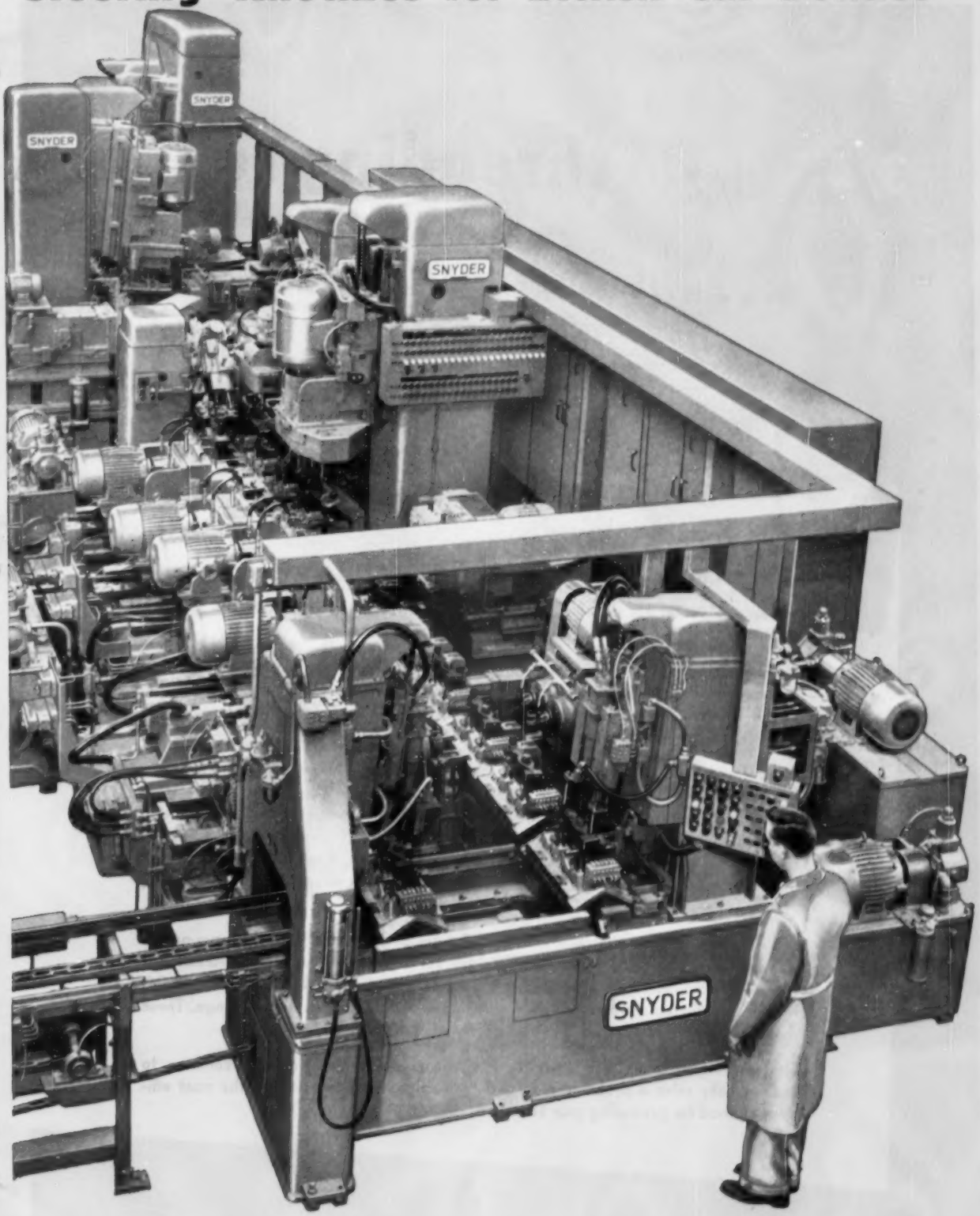

3/4"- 4.320" threading range

. . . with one LANDMACO Machine

The Twin Disc Clutch Company Hydraulic Division in Rockford, Illinois, is able to thread a wide variety of work from 3/4"-32 pitch to 4.320"-12 pitch with just one LANDMACO Threading Machine.

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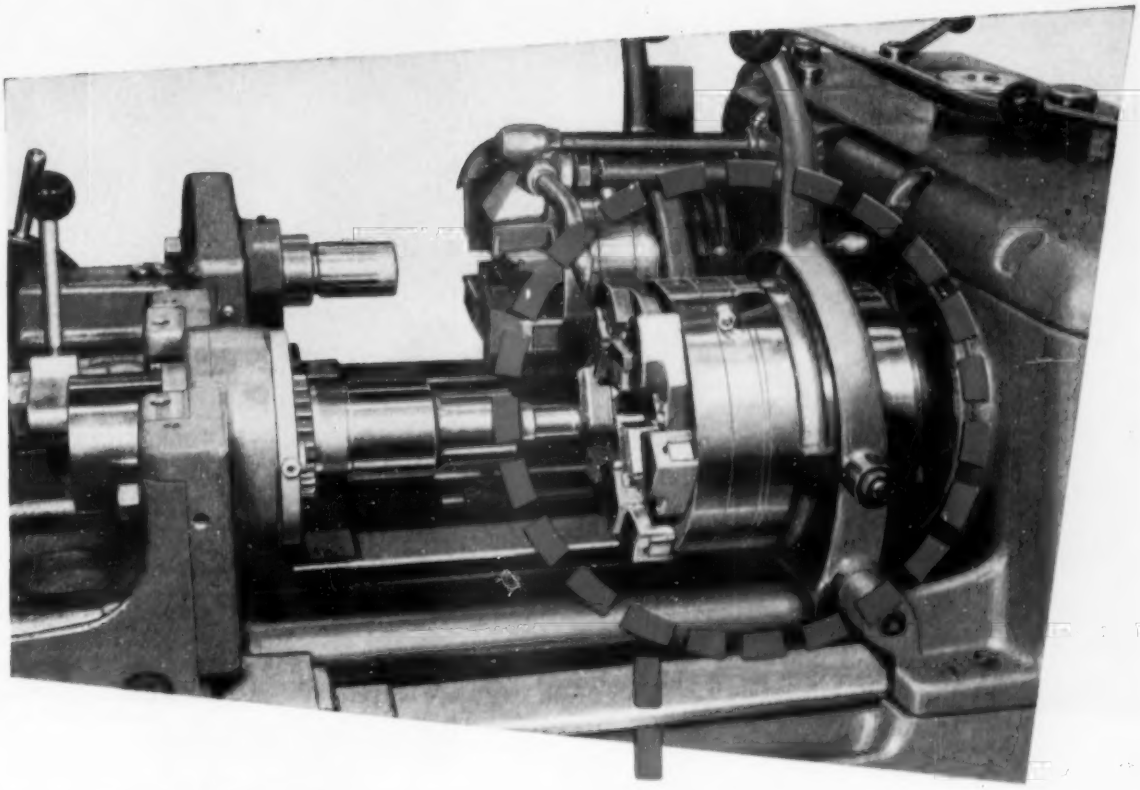
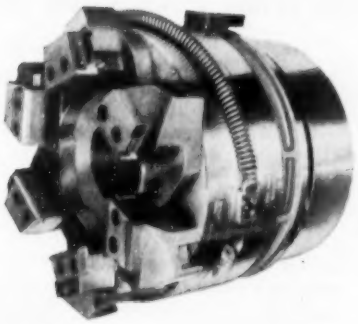
One of the many different operations performed by this equipment is illustrated—threading clutch output shafts with the 40RX Head. The workpiece is made from C1045 steel, heat-treated to 229-269 Brinnell hardness. A special 12-pitch UN Thread, with a 3.669"-3.676" pitch-diameter tolerance, is cut .830" long to within ¼" of the shoulder. 15 pieces are threaded per hour, including 100% inspection by gauging on the machine. Even with heat-treated material and exacting thread finish requirements, 100 pieces are completed between chaser grinds.

The different types of special workholding fixtures designed for these short-run operations at Twin Disc are a major factor in the versatility of the equipment used. For example, in the operation illustrated, a special carriage front allows this LANDMACO Machine to thread a workpiece with a diameter well beyond its normal range. These special fixtures may be used interchangeably with the standard vises.

This installation shows how LANDIS Equipment and Engineering can combine to economically solve a problem in Thread Production. May we suggest the most efficient method for producing your Threads?





For additional information:

* on the many types and styles of LANDIS Die Heads, ask for Bulletins F-80 or F-90
* on LANDMACO THREADING Machines, ask for Bulletin H-76.

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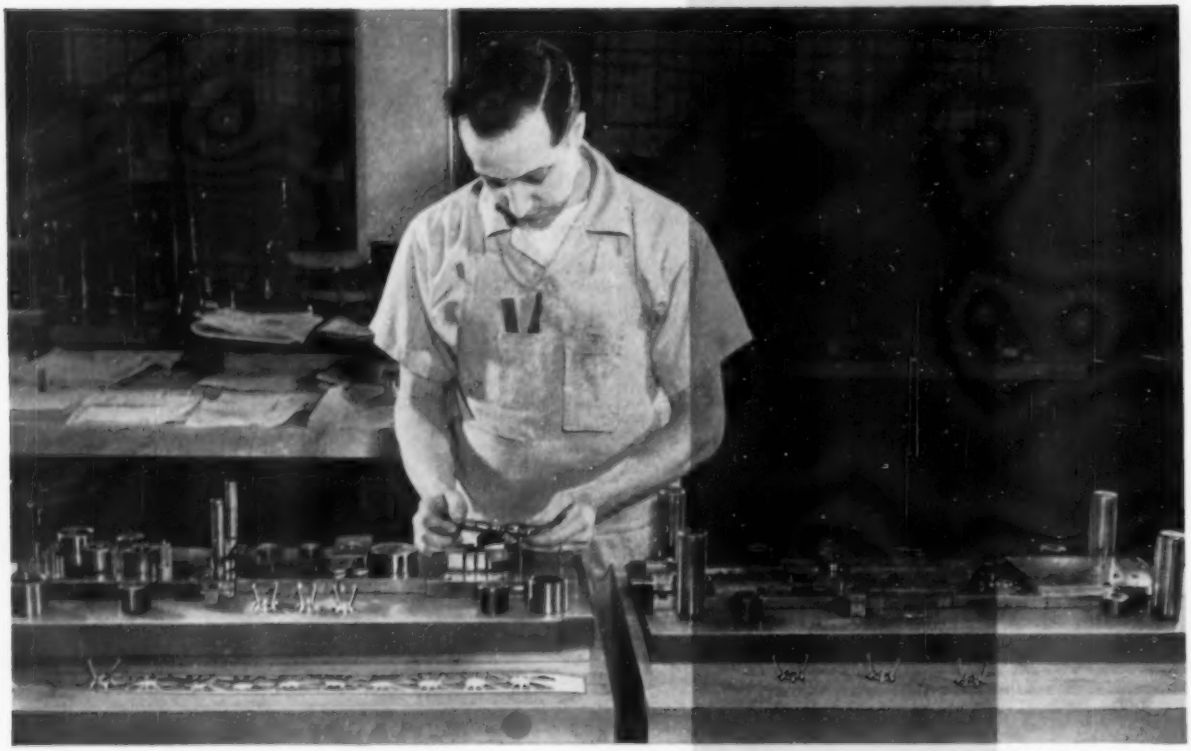

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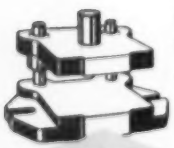

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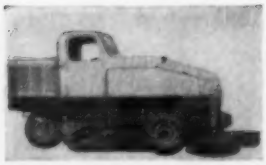

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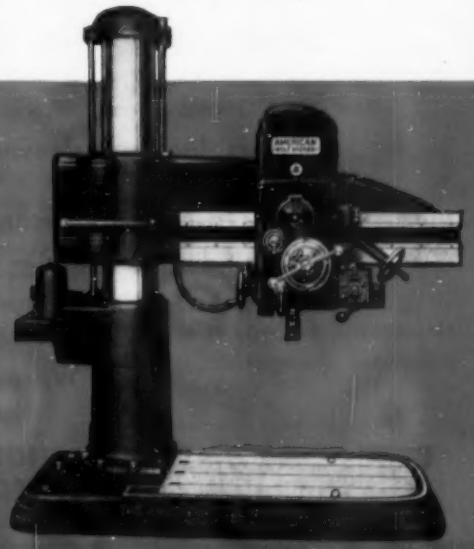

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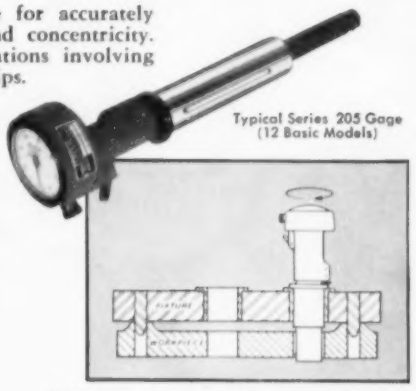

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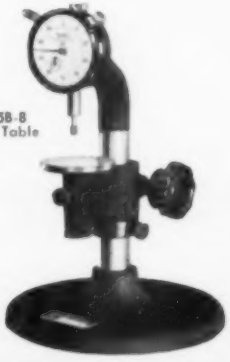

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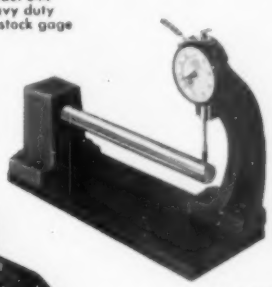

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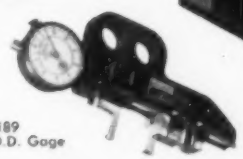

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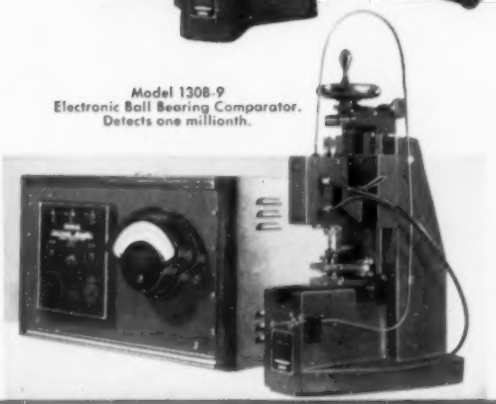

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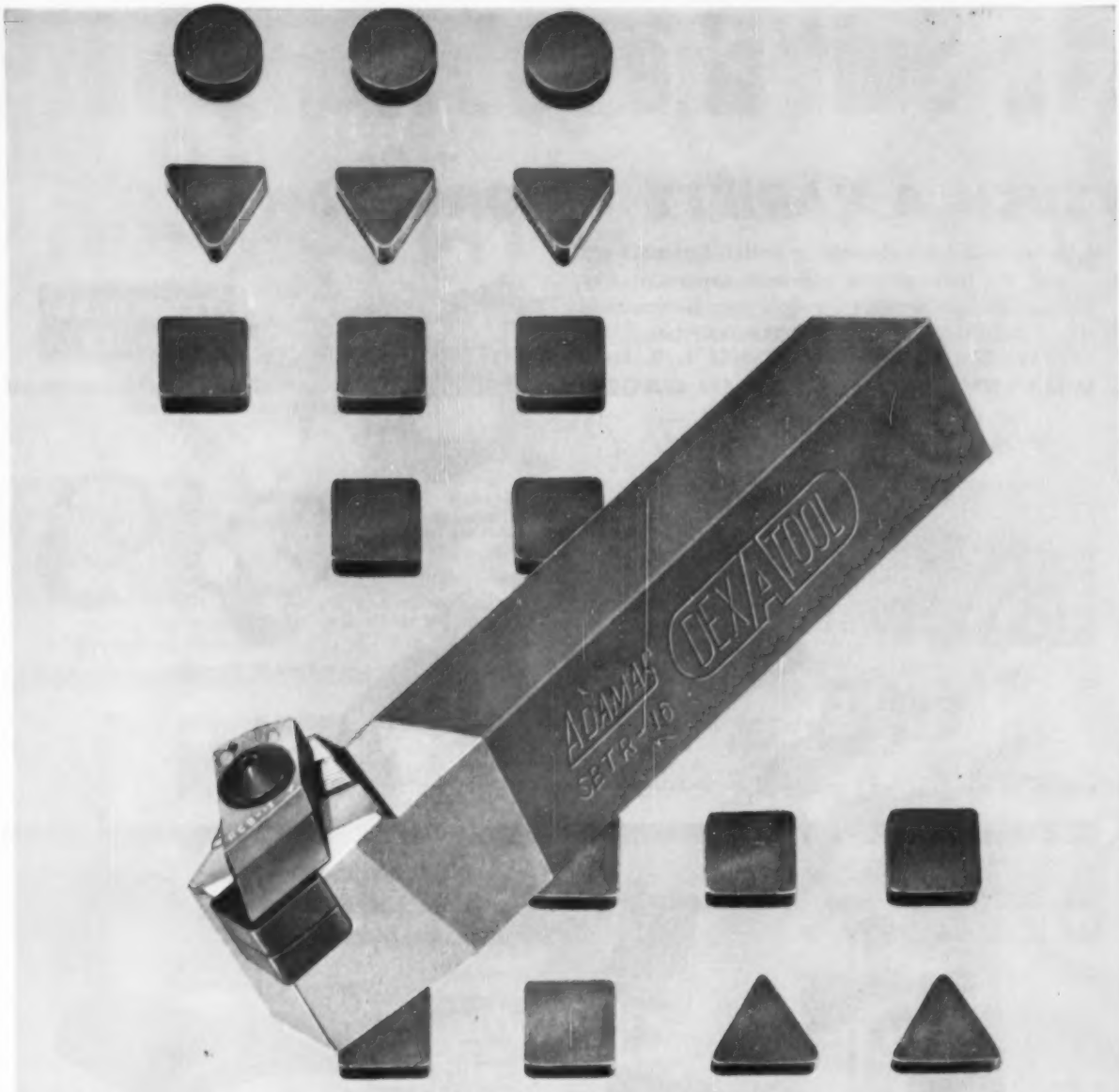

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ELECTRIC CYCLE SELECTOR CUTS CHANGE-OVER FOR MARLIN-ROCKWELL CORP.

Three different cycle patterns available for machining bearing races

This smart setup on the Gisholt MASTERLINE No. 12 Automatic Production Lathe may give you some cost-cutting ideas. Marlin-Rockwell Corp., Jamestown, N.Y., is using it to machine 9 different sizes of steel inner and outer bearing race forgings in record time.

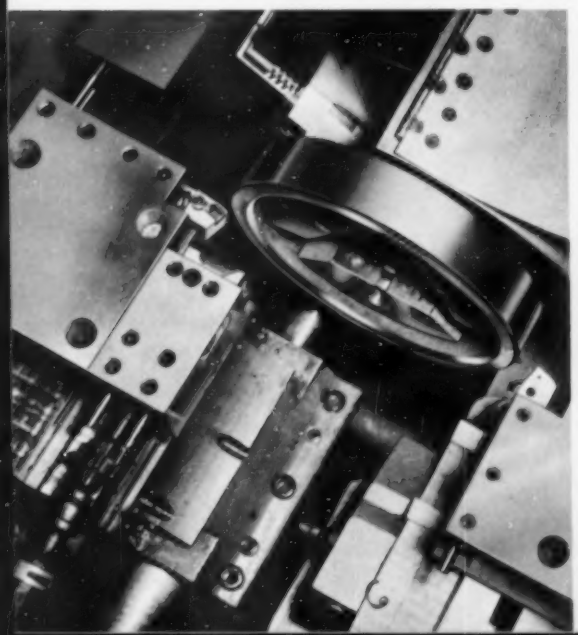
All workpiece sizes are handled within 3 basic cycle patterns (shown in diagrams) for the front carriage. In setting up for each part, the operator simply selects the correct cycle from a 3-position switch on the starter box at the rear of the machine.

Cycle No. 1 is for outer bearing races. A typical setup is shown below. Work is chucked in the I.D. Front carriage tools traverse, feed longitudinally to turn and form the O.D. chamfer, and cross-feed to chamfer the I.D., while a tool on the rear independent slide faces the part. Both the carriage and slide reverse-traverse to starting position, completing the cycle. Floor-to-floor time for all sizes: only 1.7 minutes.

Cycle No. 2 is for inner bearing races. Work is chucked on the O.D. Front carriage tools bore and form the I.D. and cross-feed to relieve the boring tool, while the part is faced from the rear slide. Both reverse-traverse to starting position to end the cycle. Three part sizes are handled in 1.6 min. f.t.f. One smaller size is completed in 1.0 min., including facing and forming the O.D. edge from the rear independent slide.

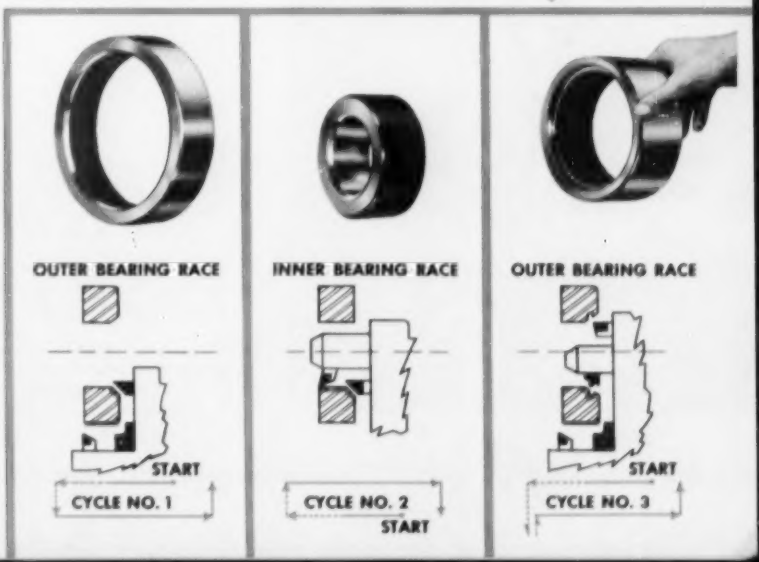
Cycle No. 3 is used on one type of outer bearing race. Chucked in the I.D., front carriage tools turn and form the O.D. chamfer, rough co-bore the I.D., cross-feed to form a snap ring groove and reverse-feed to clear the form tool. Again, facing is from the rear slide. Reverse-traverse to starting position completes the cycle. F.t.f. time: 1.5 min.

Simple selector switch cuts downtime by making 3 basic operating cycles instantly available. Different chuck jaws are required for inner and outer races. Jaw inserts handle diameter changes. Minor tool and stop adjustments permit completion of change-over in record time.



Tooling for cycle No. 1. Note swivel-jaw which minimizes distortion and centralizes part.

Three different part types handled are shown after first machining operations.



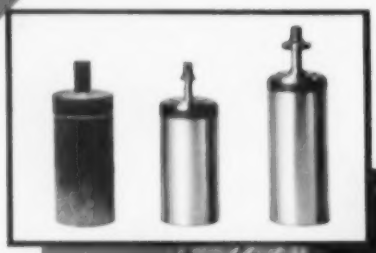
MASTERLINE GISHOLT SINCE 1887

TIME-SAVING IDEAS

CUT MACHINING TIME WITH

HOW MACHLETT LAB. MACHINES TRI-METALLIC PARTS

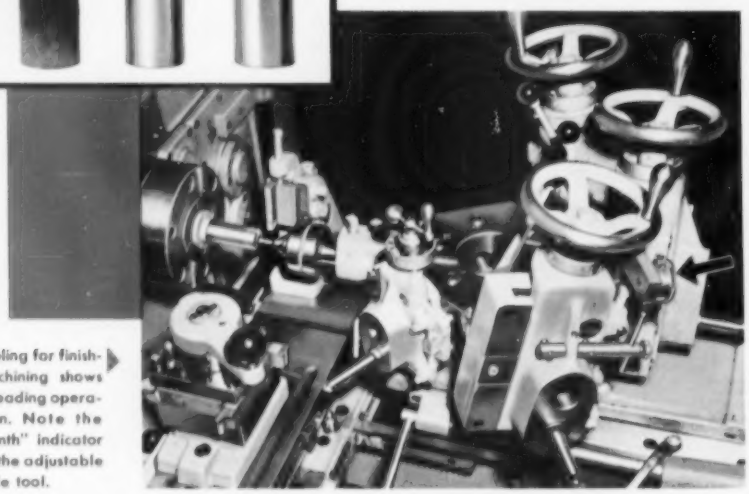
Speeds operations, assures accuracy with "tenth" indicators on adjustable slide tools



Two different workpieces handled. Largest is 4¼" long; smallest is 3½". Both are 1½" in diameter.

This well-planned operation rates close study.

Machining DX anode assemblies, Machlett Laboratories, Springdale, Conn., is getting close tolerances and fine finishes with the new Gisholt No. 3 MASTERLINE Ram Type Turret Lathe—handling easily distorted copper tubing in the body, a steel insert shoulder and head, and a threaded end of molybdenum.



Tooling for finish-machining shows threading operation. Note the "tenth" indicator on the adjustable slide tool.

Three operations complete each workpiece. For the first, the part is chucked in the I.D. on an air-operated expanding mandrel and the O.D. is rough-machined. A live center supports at the end while tools on the square turret and rear tool post face and form.

Turned end-for-end for the second operation, the part is held in an air-operated collet chuck on the previously machined O.D. Hex turret tools rough- and finish-bore the copper body and co-bore the steel insert at the far end. For finish boring, "tenth" indicators are mounted on the adjustable slide tools to hold tolerances of .0005" in the co-bore and .001" in the body.

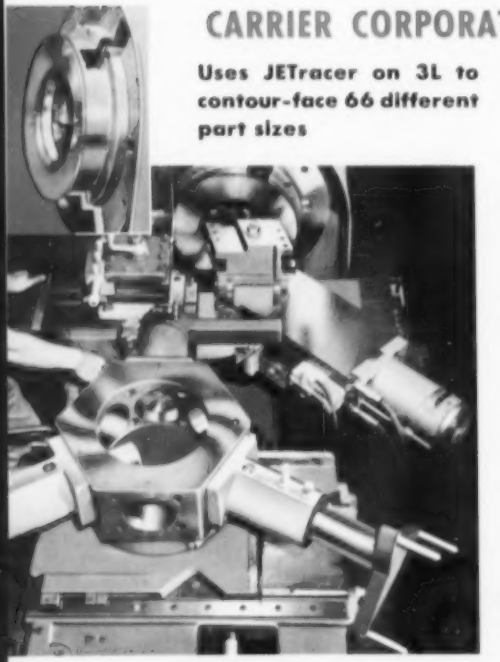
For the third operation (shown in illustration), the piece is again chucked in the bore on the mandrel and all O.D. surfaces are finish-machined, threading the molybdenum insert end from the hexagon turret with a self-opening die head and turret-threading attachment.

Tooling remains intact for all 3 operations. Concentricity is held within .001" between I.D. and O.D. over length of part. F.t.f. times: 3.10 min. for first operation; 4.65 for second; 3.10 for third.

A Preventive Maintenance Chart is now available for both Ram Type Turret Lathes and Saddle Type Turret Lathes. Write Gisholt for copy.

CARRIER CORPORATION CUTS TOTAL TIME 50% ON IMPELLER WHEELS

Uses JETracer on 3L to contour-face 66 different part sizes



Tooling used to finish-machine impeller cover. Note turret-mounted template carrier in center. Inset shows finished part on special fixture mounted on chuck.

You, too, may be able to use a setup like this one at Carrier Corporation, Machine & Systems Division, Syracuse, N. Y. Here, the modern JETracer—on the bridge type cross slide on a standard 3L Saddle Type Turret Lathe—improves machining of 37 different sizes of steel impeller hubs, 29 different sizes of mating covers, and repair parts for impeller wheels used in the manufacturer's well-known centrifugal compressors.

Eight separate operations, 4 in each face, are used for the 21"-diam. part shown at left. Alternating machining between faces cleans up any stress distortions and assures concentricity and parallelism between the contoured surfaces.

The part is gripped on the O.D. by a special fixture (mounted on a 24", air-operated 3-jaw chuck) to machine one side, and held in the bore by an air-operated expanding mandrel to machine the other side. Before each chucking, a turret-mounted pusher forces the work on a support ring against a vibration dampener.

Straight boring is handled from the hex turret, which also carries a special turret-mounted template carrier to govern movement of the JETracer. Tools on the cross-slide square turret turn, rough-face and chamfer—and the JETracer rough- and finish-machines the contoured face. A variable-speed motor drive assures constant surface cutting speed to meet surface finish requirements.

Total floor-to-floor time for all 8 operations is only 46.25 minutes, replacing several different machines formerly used. Total machining time was cut 67%. Tolerances are held to ± .001" on the bore and ± .005" on thickness.

GISHOLT

LOOK AHEAD... KEEP AHEAD... WITH GISHOLT

GISHOLT

TIME-SAVING IDEAS

HOW WALWORTH SIMPLIFIES CLOSE-TOLERANCE TAPER BORING

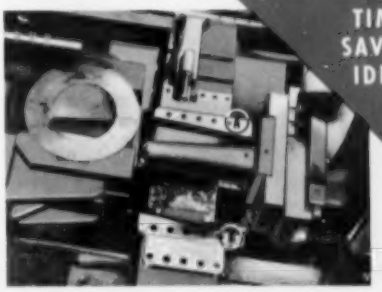
Special cams on front and rear cross slides guide taper-boring slide tool

You may see ways to cut costs in your own operations by checking this setup. With it, the Walworth Company, Inc., Kewanee Works, Kewanee, Ill., gets accuracy and fine finish on 11 different sizes of cast iron and cast steel plug valve bodies. The machine used is the Gisholt Fastermatic Automatic Turret Lathe.

Workpieces are held in a hand-operated 2-jaw chuck. A turret-mounted carrier bar simplifies loading, moving the rough workpiece into the chucking fixture and locating it accurately for length before chucking. Rough- and finish-taper boring, counter-boring, grooving, facing and sizing operations are handled by hexagon turret tools.

An unusual camming arrangement assures accurate machining and fine finishing of the taper bore and counter-bore. Here's how it works: Carbide-tipped followers (A and B), on both sides of the taper-boring slide tool, move between special plates, with solid carbide cam strips, mounted on the front and rear cross slides. Air-operated follow-up from the rear cross slide forces the taper-boring slide tool to follow the cam on the stationary front cross slide, generating the required taper in the plug valve bore. Results: extreme taper accuracy and uniform fine finish, so essential for long service life.

Eleven different parts are handled, with f.t.f. times ranging from 9.4 min. on smallest 2" plug valve body, to 22.8 min. on largest 6" body shown in illustration. Special taper cam eliminates human error, provides finer finish.

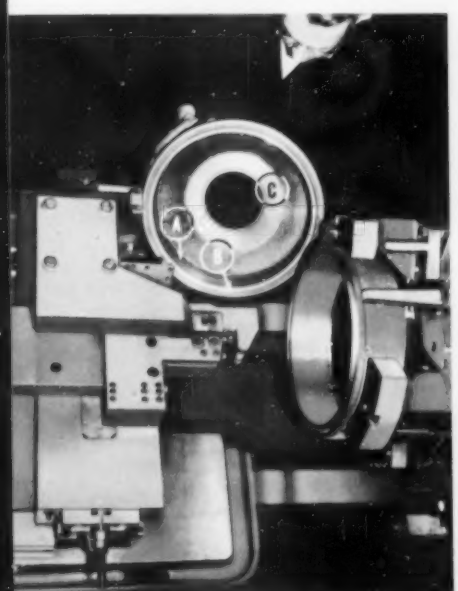


Fixture, workpiece and tooling for 6" flanged plug valve body. Note carbide-tipped cam followers A and B on taper-boring slide tool.

Overhead view shows the carbide cam strips on the cross slides and the taper-boring slide tool followers engaged, prior to the finish boring operation.

MACHINES BRAKE DRUMS FRONT AND BACK IN SINGLE CHUCKING

Well-planned setup handles 13 surfaces, including straddle-facing and boring



Overhead view shows platen table back for loading and unloading. Note straddle-facing and boring tool arrangement.

In looking over this tooling setup on the Gisholt Simplimatic, you may spot ideas on low-cost machining of parts like these cast iron brake drums. Four different sizes are handled, with minimum tooling change-over and adjustment between sizes.

Here's how the 19"-diam. drum is machined, holding work in a 24", 3-jaw air chuck. Using extended jaws plus operating the Simplimatic table 12" back of standard position gives the straddle-facing tools ample clearance. Wide swivel jaws centralize the part and minimize distortion. A positive stop locates the work from the back side of the rim.

The front slide mounts a cam-operated auxiliary slide which engages the 2 tools that bore the large I.D. (A), reducing machining time by dividing the cut. Other tools on this slide chamfer the I.D. edge and turn the rim (B). A special tool block holder on top of the front slide carries additional tooling to rough- and finish-bore the web (C). As the platen table moves into operating position, tools on the rear independent slide protrude through the bore. Standard slide movement lets the tools straddle-face, chamfer and co-bore the web (C), and at the same time finish-face and form the rim (B) to complete the part.

The Simplimatic—ideal for jobs like this—holds f.t.f. time on this part to 4.2 min. Wide platen table permits positioning of slides and tooling to machine more surfaces in less time. Automatic cycle frees operator for additional machines or other work.

MASTERLINE GISHOLT SINCE 1887

TIME-SAVING IDEAS

HERE'S HOW TRANE COMPANY BALANCES 45 DIFFERENT BLOWER FANS

Smart tooling assures accuracy by minimizing parasitic weight

If your production setup includes balancing of rotating parts, you'll want to read how The Trane Company of La Crosse, Wis., uses the Gisholt 1S DYNETRIC Balancer on a wide variety of similar parts—with minimum change-over.

Here, the 1S handles 45 different types of single- and double-width blower fan wheels used in air conditioning, ventilating and special industrial process systems. Although weights and sizes of the fans fall within the 1S range, in some instances the weight of a standard arbor used for support equals or exceeds the weight of the part.

Here's how the effects of this parasitic weight are minimized: Fan wheels are divided into two groups, one with bore diameters less than 1" and the other 1" or larger. In each group, the widest fan determines the length of arbor used for that entire group. The arbors have small bearing diameters and a larger center diameter with a shoulder and key. A keyed bushing is pressed onto the arbor. Parasitic weight is minimized by slots milled through the bushing, leaving 6 lands 3/8" wide to support, locate and drive in the hub of the fan wheel to be balanced.

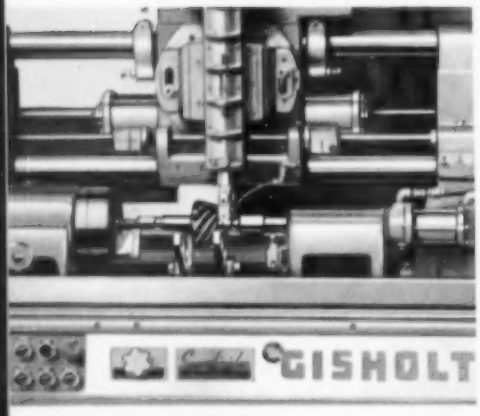
Unbalance is located and measured in 2 planes, and corrected by adding solder on the outer shroud rings. The fan is rotated again to inspect for balance, completing the operation.

Operator rotates workpiece to check for any unbalance remaining after correcting with solder, in 2 planes, at each end of the part.

A large variety of similar parts is handled with minimum change-over through well-planned tooling. The 1S handles all production, assuring quiet, vibration-free operation of high-speed, lightweight parts.

THIS SETUP SUPERFINISHES 120 PINION GEARS AN HOUR

Eliminates operator fatigue with loading rails, air-operated tailstock



Workpiece shown held between centers ready for Superfinishing operation. Note loading rail, faceplate driver and air-operated tailstock.

Want convincing evidence of what Superfinishing can do to lower costs and improve quality?

This manufacturer is completing bearing surfaces, on 8 different sizes of steel rear drive pinion gears, at a rate of 120 parts per hour at 80% efficiency—using a Gisholt 51A Superfinisher. Here is peak production—attained by using a standard machine with a simple set of loading rails, plus an air-operated tailstock to pick up the workpiece prior to the Superfinishing operation.

Here's how it works: The operator moves each part to the loading rail, where it rolls by gravity and stops automatically in line with the tailstock center. A faceplate driver catches the splines on the workpiece, and movement of the tailstock center lifts the part from the loading rail to clear the work during the automatic Superfinishing cycle. The surface finish is reduced from 20 to 30 down to 5 to 7 micro-inches R.M.S. or less, in just 25 seconds f.t.f. time.

Eight different workpiece sizes are Superfinished with minimum change-over. Superfinishing provides extremely smooth surface finish in less time, and exposes true base metal for long surface life which promotes trouble-free operation.

No. 5-657
681

THE GISHOLT ROUND TABLE represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.

GISHOLT

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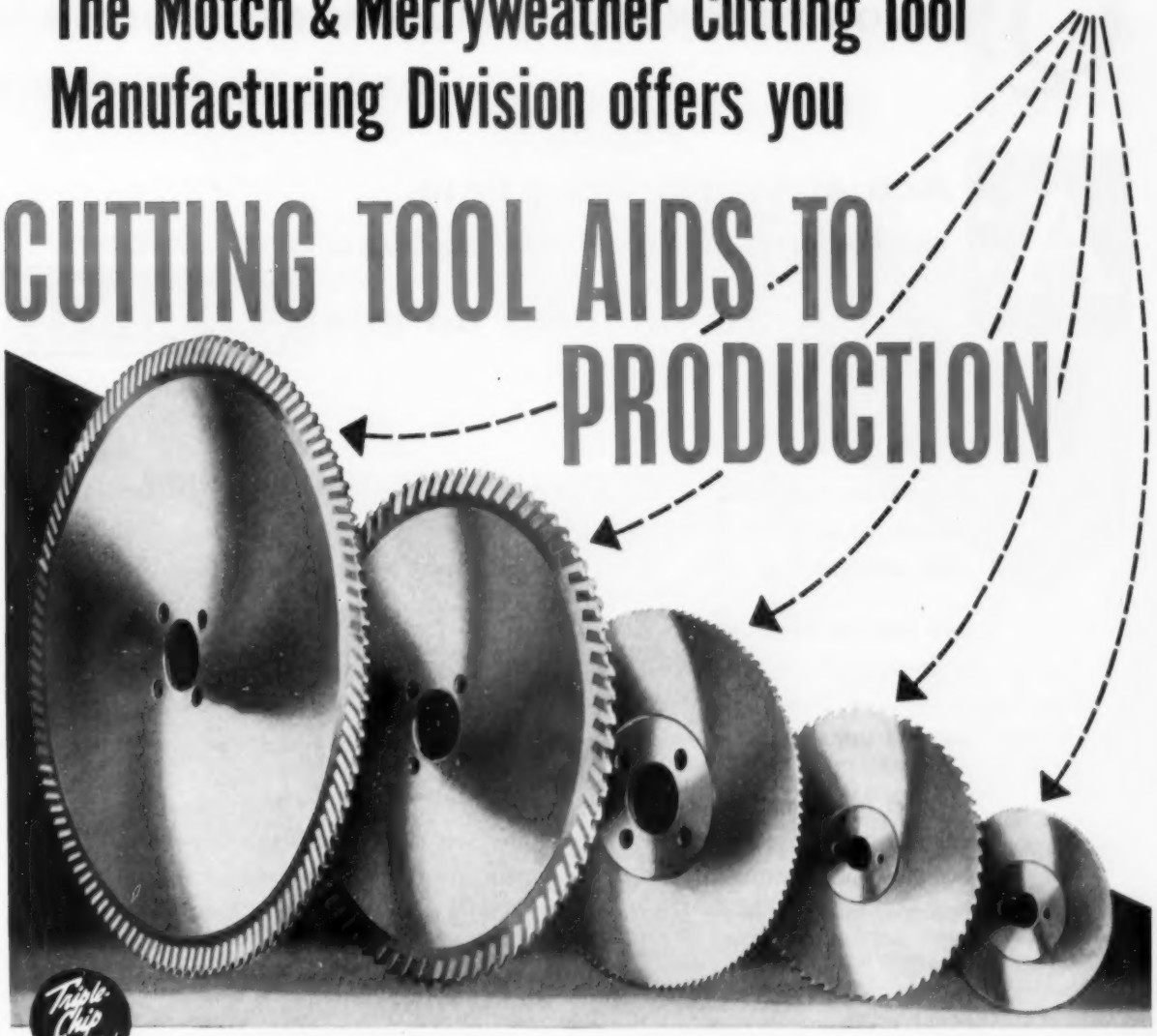

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That's pretty fast, for 38 slots . . . and every slot broached perfectly to close tolerances, around the periphery of a stainless steel turbine wheel having 1½-inch rim thickness. Fully automatic operation — no downtime, no rejects, *no problems!*

This Lapointe Electro-Mechanical Broach, built with 30 hp motor and 100-inch stroke, is generally acknowledged as the *right* machine for broaching small turbine wheels ranging in size from 10-inch to 12½-inch diameter. The number of slots can be changed, and the machine will also accommodate other wheels of the same design by changing the adapter.

Whether you're broaching turbine wheels or performing some other equally difficult repetitive metal cutting operation, it will pay you to look in at Lapointe — where you can place the responsibility for your entire broaching program: we design and build the broaching machines, design and build the broaching fixtures, design and make the broaches.

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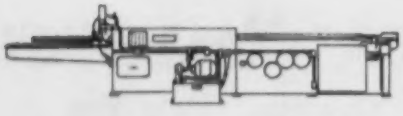
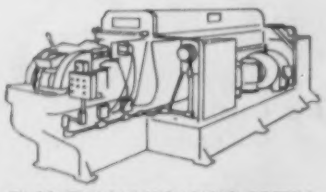
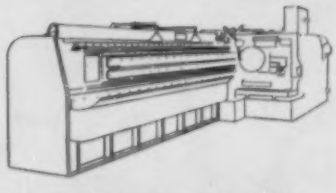


60" STROKE HORIZONTAL, ELECTRIC



CH CONTINUOUS BROACHING, ELECTRIC



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SMALL TURBINE WHEELS
30 MINUTES?

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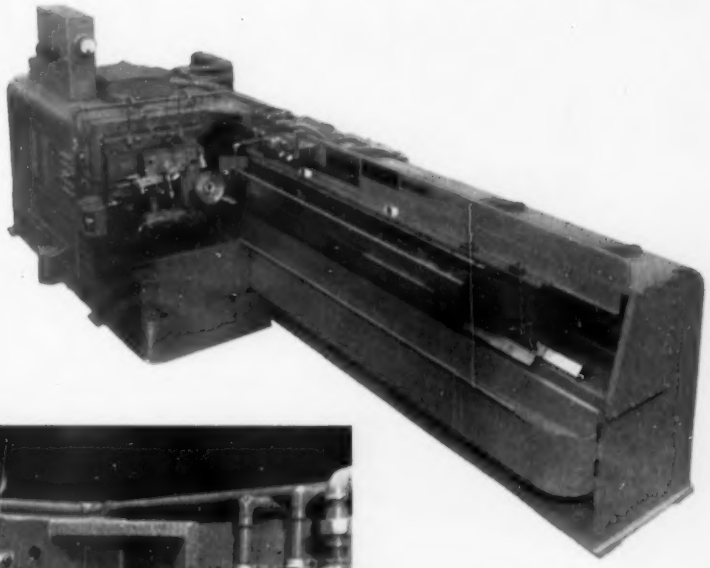
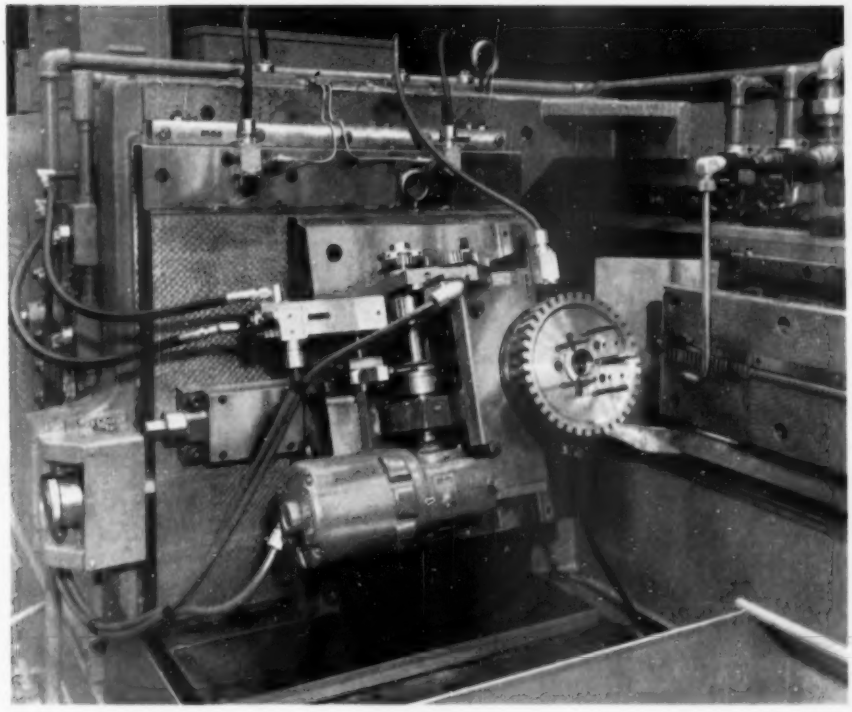
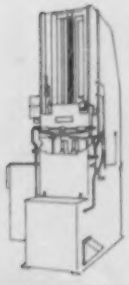


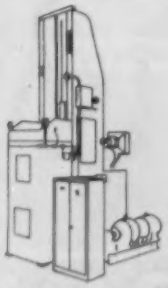


Versatile, flexible, *smooth*, this Lapointe 30/100 SRHE Electro-Mechanical Broach has variable speeds . . . up to 300 feet-per-minute and more. Available in two slide widths, 16" and 27", and in strokes up to 240-inch.

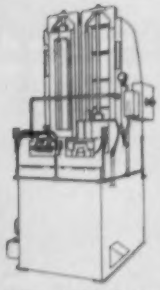
The Lapointe-designed broach adapter shown at the left is built with full back-up support. Fixture has a fixed angle, but the machine can be supplied with universal cradle type fixture.



VUE-7 VERTICAL PULL-UP ELECTRIC



SRVE SINGLE RAM VERTICAL, ELECTRIC



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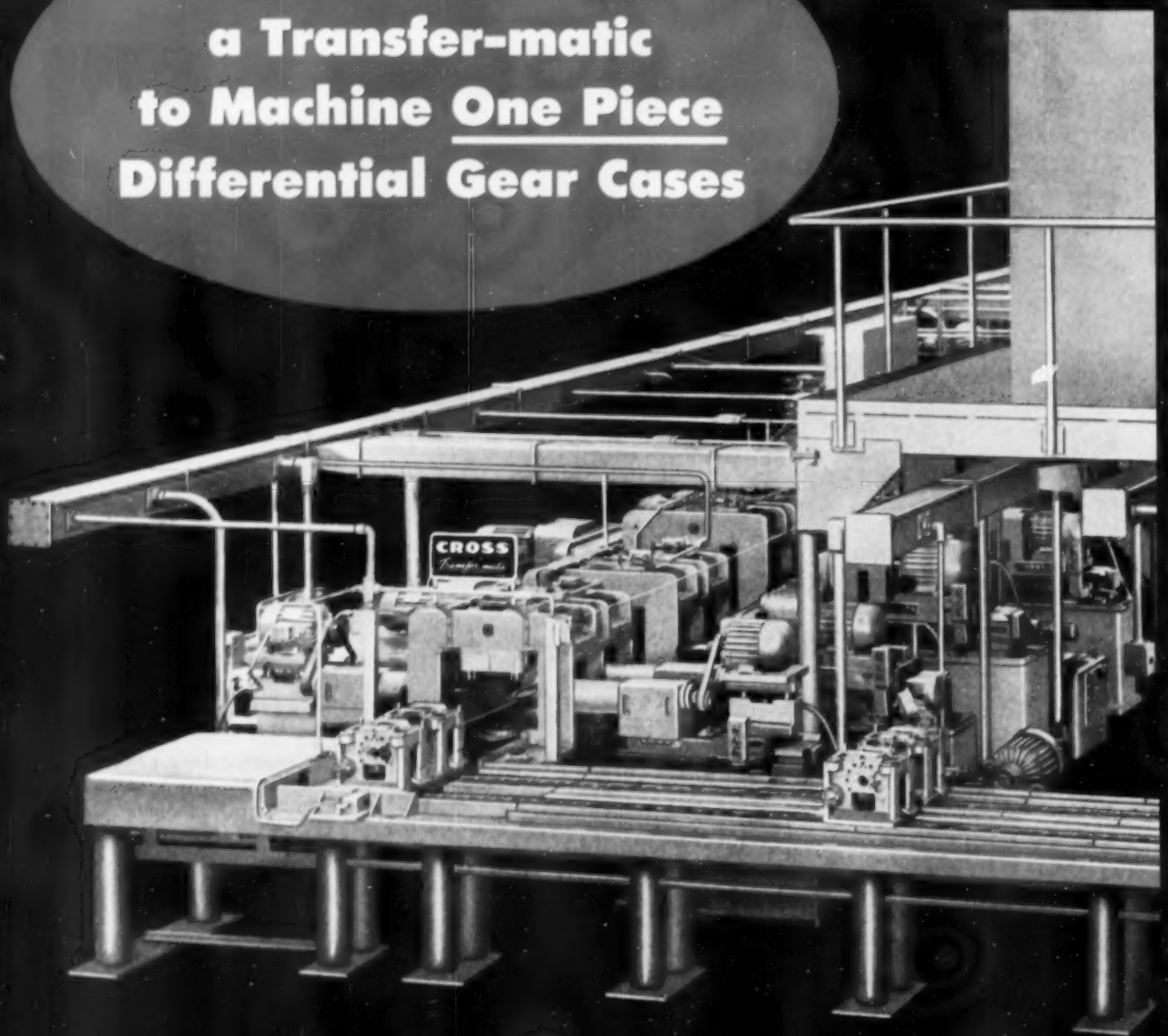
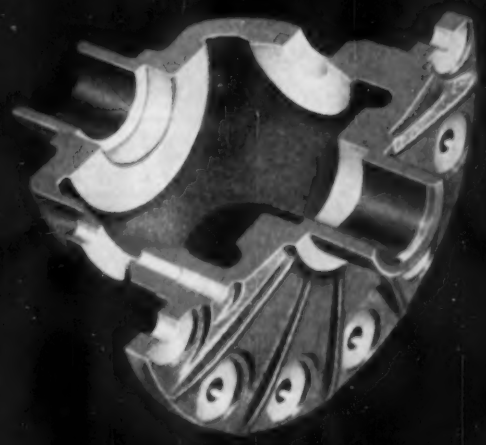
Another Cross First – a Transfer-matic to Machine One Piece Differential Gear Cases





Cutaway view of differential gear case showing machined surfaces.

Established 1898

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First in Automation

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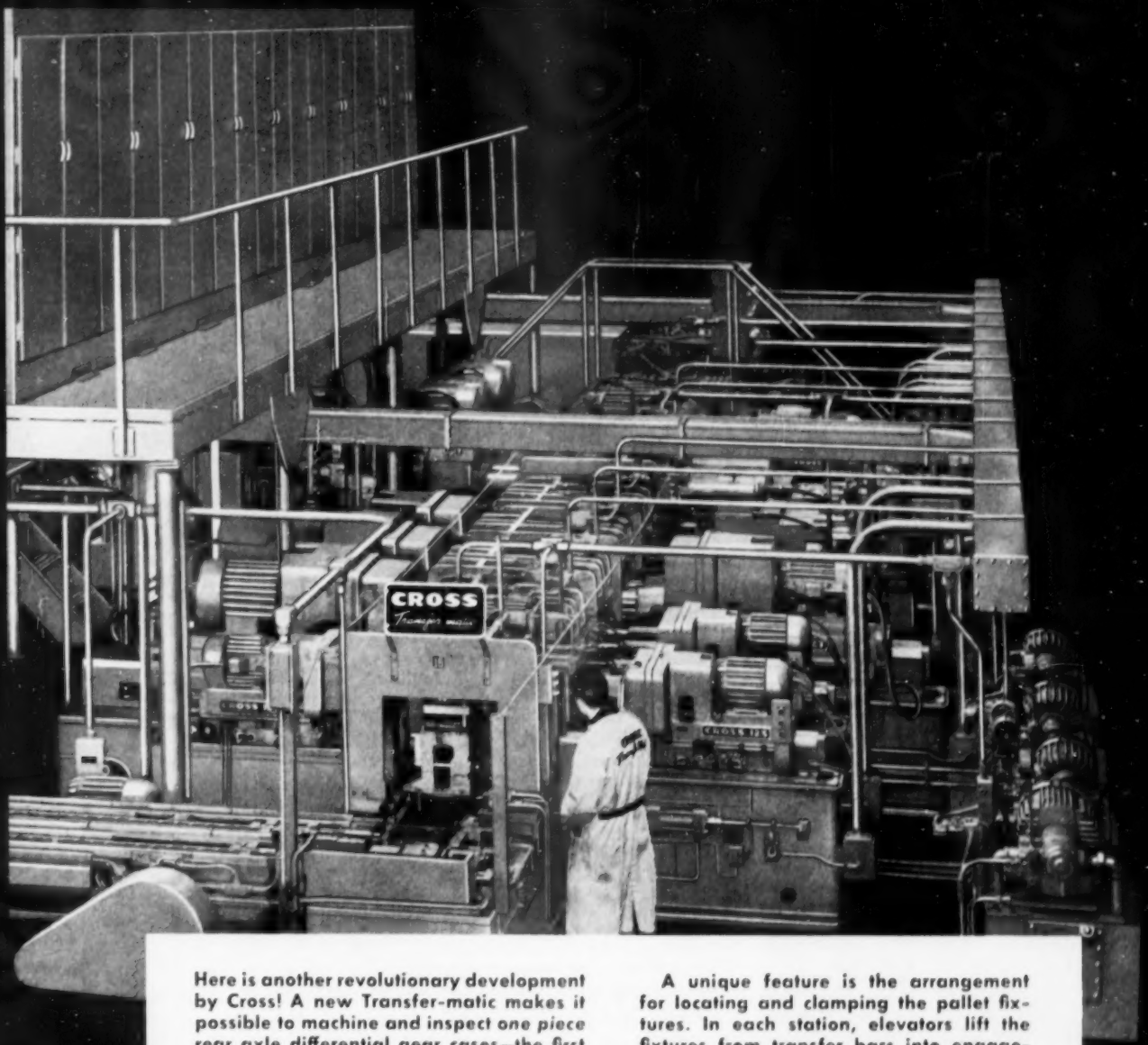
Another Transfer-matic by Cross

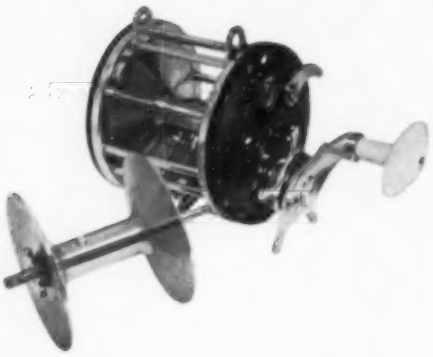


Here is another revolutionary development by Cross! A new Transfer-matic makes it possible to machine and inspect *one piece* rear axle differential gear cases—the first time such a part has been processed on a transfer machine.

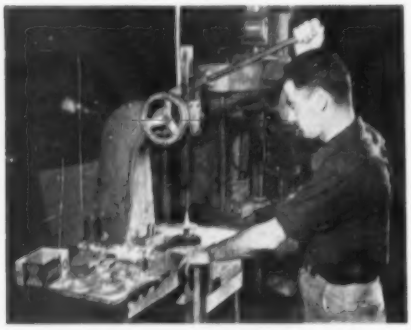
Two cases are machined at a time as they travel a distance of 206 feet through 30 stations. Rated capacity is 212 pieces per hour at 100% efficiency. Operations include rough and finish forming the two spherical seats for the pinions; rough and finish boring and facing the two seats for the side gears; drilling, boring and reaming the pinion shaft hole; drilling and reaming the lock pin hole; drilling, chamfering, spotfacing and reaming the twelve ring gear mounting holes.

A unique feature is the arrangement for locating and clamping the pallet fixtures. In each station, elevators lift the fixtures from transfer bars into engagement with locating pins and stop buttons fixed in the overhead bridge structures. Individual wedges then back up the elevators to secure the pallets. After cutting, the elevators lower the pallets onto the transfer bars, which carry them to the next station.

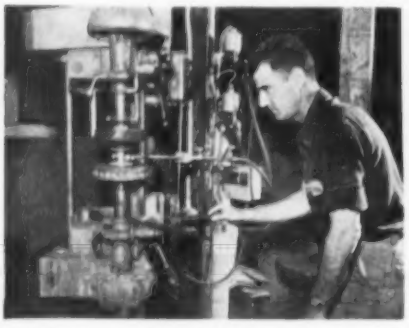
Other features include construction to JIC Standards, hardened and ground ways, complete interchangeability of all standard and special parts, pre-set cutting tools and Cross Machine Control Units which program tool changes to reduce machine downtime.



JOIN WITH HANDY & HARMAN SILVER BRAZING FOR PERMANENT PROFIT



Inserting fluxed spindle and EASY-FLO silver alloy ring into lower half of spool. Assembly is completed when upper half of spool is pressed onto spindle. Press fit is necessary to maintain proper joint clearance between brass spool and steel spindle at brazing temperature.



Sliding burner assembly into heating position. Weight of upper platen assures accurate joint fit when ring of EASY-FLO alloy melts. Fuel is mixture of city gas and oxygen. Operator brazes 20 to 30 spools per hour.

This Yarn Has Fishermen Reeling ...With Absolute Confidence

Anybody who has ever caught a big fish knows the importance of a good reel. That's why manufacturers of fishing tackle are striving constantly for improvements in both design and production methods.

For example, when nylon line first appeared, Ocean City Manufacturing Company, the country's largest manufacturer of fishing reels, realized that the design of the reel spool would have to be changed. This because, with a big one on the line, the tremendous compressive forces of tightly wound elastic nylon often caused the spool flanges to spread so that the spool bound against the reel housing. Silver brazing with Handy & Harman EASY-FLO 45 silver brazing alloy and HANDY FLUX permanently and simply solved this serious problem.

Originally the spools were assembled from two fully machined brass forging halves with the hollow hub of each half fitted over a solid steel spindle with the drive clutch at one end. Each half was secured with ⅛" stainless steel pins driven through the spool hub into the internal spindle.

The same spool components are still used except that now semi-machined brass spool halves are silver brazed directly to the steel spindle with a preplaced ring of EASY-FLO 45 alloy. The shear strength of the brazed joint now exceeds 40,000 psi and because of the greater area of adherence to the spindle (as compared to two stake points previously used) spool hub creep toward the spindle ends is eliminated. The alloy cost is only 1.3 cents. The assembled spool is now finish-machined as a unit. The machining time once required for drilling and aligning has been eliminated. And when time is reduced and a product is improved, costs are reduced and sales are improved.

These same benefits could easily apply to the production of your product. The simple fact is that silver brazing with Handy & Harman brazing alloys has paid off handsomely for those who use it. The only way to find out if and how your product or methods fit the picture is to ask us —we'll be delighted to work with you all the way.

TO HAVE AND TO HOLD

BULLETIN 20 tells you why high strength, speed and economy are inherent in EASY-FLO silver brazing. Also gives Handy information about joint design and fast brazing methods. We'll be pleased to send you a copy.

Your NO. 1 Source of Supply and Authority on Silver Brazing Alloys

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Here's your SUPER-MARKET for tool room grinding wheels

Norton makes wheels for every tool room job . . . precision-built for "TOUCH of GOLD" uniformity

"Everything under one roof" is the modern super-market advantage you get with Norton wheels — the world's largest line, with exactly the right wheel for every tool room grinding job you do.

Norton wheels are precision processed to duplicate wheel balance and structure with precise uniformity.

To you, this means wheel after wheel and lot after lot will grind alike — with the same time-and-money-saving "Touch of Gold" performance.

And remember: only Norton offers you such long experience in both grinding wheels and grinding machines to help you produce more at lower cost. For aid in wheel selection and helpful booklets on tool room operations, see your Norton Distributor. Distributors in all industrial areas, listed under "Grinding Wheels" in your phone directory, yellow pages. Behr-Manning Company, Troy, N. Y., division of Norton Company. *Export:* Norton Behr-Manning Overseas Incorporated. **For the booklets or other information write to Norton Company, Worcester 6, Massachusetts.**

W-1761

NORTON ABRASIVES

Making better products... to make your products better

NORTON PRODUCTS: Abrasives • Grinding Wheels • Grinding Machines • Refractories
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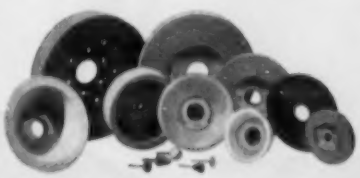
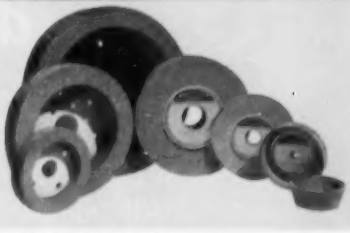


NORTON G BOND AND BE BOND WHEELS bring you the most efficient vitrified bonds ever developed for precision and semi-precision grinding. For sharpening and for surface, cylindrical and internal grinding on all steels and cast alloys use G Bond or BE Bond Wheels in 32 ALUNDUM*, 38 ALUNDUM, 19 ALUNDUM, or the new non-premium priced 44 ALUNDUM abrasive.

NORTON DIAMOND WHEELS for carbide grinding are backed by long leadership in diamond wheel development and manufacture. The regular B resinoid bond is ideal for wet grinding — the B6 resinoid bond for dry grinding.



NORTON K BOND WHEELS IN CRYSTOLON* abrasive are often the best investment for many carbide grinding jobs. The vitrified K Bond comes in half-grade increments of hardness, enabling you to "pin-point" your specifications.

BOOKLETS THAT TELL YOU ALL. *A Handbook on Tool Room Grinding* is over 200 pages long and crammed with facts it will help you to know. *How To Select Wheels For Precision Grinding Tool And Constructional Steels* shows the way to correct wheel selection. Get these from your Norton Distributor or write to the nearest District Office of Norton Company, Worcester 6, Massachusetts.

*Trade-Marks Reg. U. S. Pat. Off. and Foreign Countries

There is a difference in contour attachments

A basic requirement of any contour attachment is to reproduce a template form in the work piece.

The difference in contour attachments is largely the degree of reproduction accuracy.

In Warner & Swasey Contour Attachments it is the MICRO-SENSITIVE HYDRAULIC CONTROL VALVE that makes a BIG DIFFERENCE.

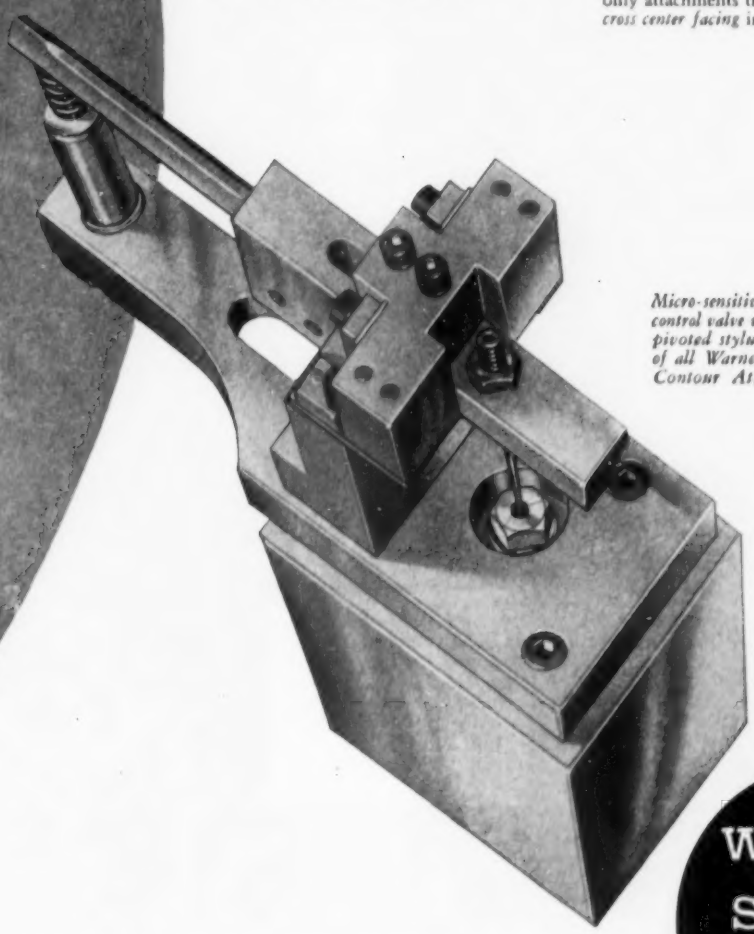
The micro-sensitive hydraulic control valve with its flexure-pivoted stylus is another achievement of Warner & Swasey's creative engineering. It's built with instrument makers' precision and individually laboratory inspected to insure the ultimate in high-fidelity reproduction of your most exacting contours. THIS IS the BIG DIFFERENCE you get in all Warner & Swasey Contour Attachments.

Available on Warner & Swasey 3-A and 4-A Saddle Type Turret Lathes.

NEW WARNER & SWASEY HEXAGON TURRET CONTOURING SLIDE TOOLS—Exclusively designed for contour boring work.

Available on No. 5 Ram Type and 2-A, 3-A and 4-A Saddle Type Turret Lathes.

WARNER & SWASEY CROSS SLIDE CONTOUR ATTACHMENTS—The only turret lathe contour units that give you *cross center facing*. Also, the only attachments that give you both *turning* and *cross center facing* in one unit.



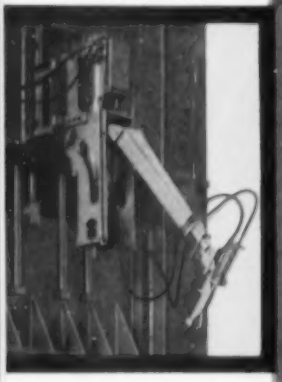
Micro-sensitive hydraulic control valve with flexure-pivoted stylus—the heart of all Warner & Swasey Contour Attachments.

YOU CAN PRODUCE IT BETTER, FASTER, FOR LESS...

WITH A WARNER & SWASEY

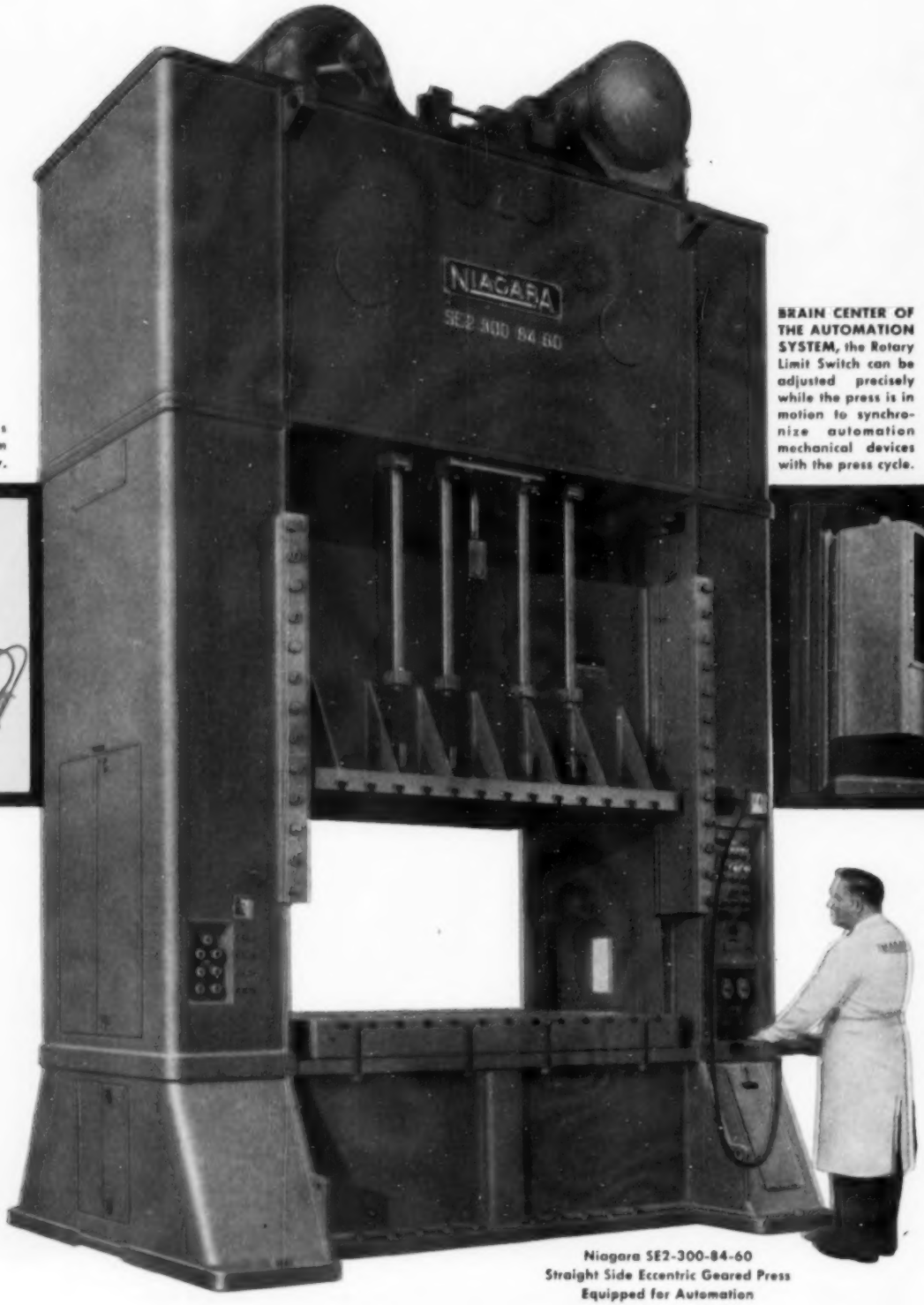
WARNER & SWASEY
Cleveland
PRECISION MACHINERY SINCE 1880

see how mighty Niagara Presses



IRON HAND removes finished stampings from the press, ***automatically.***

BRAIN CENTER OF THE AUTOMATION SYSTEM, the Rotary Limit Switch can be adjusted precisely while the press is in motion to synchronize automation mechanical devices with the press cycle.



Niagara SE2-300-84-60
Straight Side Eccentric Geared Press
Equipped for Automation

are automated for peak productivity

Engineered to excel in large, heavy tonnage drawing, punching and blanking work, Niagara Straight Side Eccentric Geared Presses are readily outfitted with the most advanced automation controls and devices. Net result: Streamlined production, greater safety and simplified operation.

Take a look at the modern, enclosed construction of this rugged Niagara Two-Point Eccentric Geared Press. See how today's most advanced automation controls and devices are furnished as integral, built-in components of the press itself . . . *with piping and wiring fully concealed.* Note, too, how the driving assembly is neatly housed within the crown. Nothing has been overlooked in making this press an outstanding engineering triumph.

Niagara's eccentric drive delivers greater torque with less deflection. Rigid, all-steel, four-piece, tie rod frame provides utmost accuracy and prolonged die life. Niagara's low inertia, pneumatic friction clutch runs cooler and outlives others, for most of its weight continues to rotate with the flywheel to reduce heat and wear.

MAKE SURE THAT YOU HAVE ALL OF THE FACTS on Niagara Straight Side Eccentric Geared Presses . . . the one point, two point and four point designs in capacities from 100 - 1000 tons . . . and how they can be equipped for automation. Write for illustrated Bulletin 66 today.

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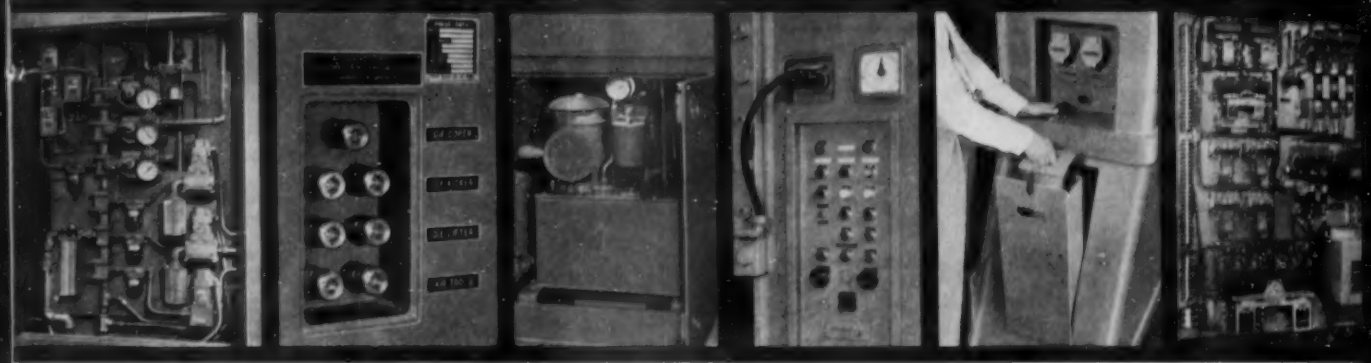


AIR CONTROL PANEL (Above left) conceals and protects air line pressure switches, lubricators, filters, gauges and valves behind dust-tight doors within one of the uprights.

CONTROLLED AIR SUPPLY RECEPTACLES (Above right) are provided for die doper, die kicker and die lifter, all synchronized with press cycle. Auxiliary receptacles are for die maintenance tools.

AUTOMATIC CIRCULATING OIL SYSTEM (Above left) sends metered flow of clean, filtered oil to all bearings and gears in the crown, as well as to slide gibs. Correct operating oil pressure is maintained or press stops automatically.

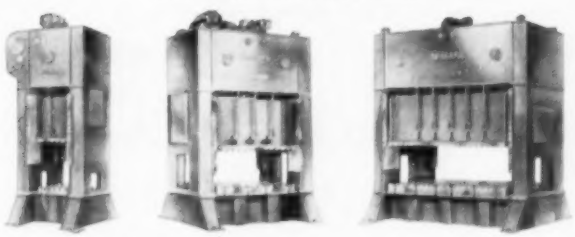
OPERATOR'S PANEL (Above right) features de-luxe operating controls conveniently arranged for fingertip direction of every press motion. Note receptacle for "RUN" push button station and Selsyn stroke position indicator.

AUX. POWER SUPPLY & SAFETY BLOCK. (Above left) Two 110 V. and two 440 V. receptacles for automation equipment, conveyors, tools, etc. Safety block (stored in bin) is chained to safety plug which de-energizes press control when pulled from receptacle.

COMB. MOTOR & PRESS CONTROL (Above right) in oil and dust-tight enclosure flush mounted in frame.

ONE-POINT, TWO-POINT AND FOUR-POINT SUSPENSION

(100 through 1000 ton capacities)



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America's most complete line of presses, press brakes, shears, other machines and tools for plate and sheet metal work.

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He renews this pledge in 1957...

your MFD*

"To Have And To Hold said tools with all the privileges thereto belonging to their own use and behoof forever. That we have good right to sell and convey the same as aforesaid, and that we will warrant and defend the same to said grantees."

* **Your Morse-Franchised Distributor** knows that Morse stands behind this warranty just as solidly today as we did 89 years ago. And in his name and behalf, Morse now re-publishes this warranty as an earnest of good faith backing up every Morse Cutting Tool you buy. Yes, you can bank on Morse . . . and on your Morse-Franchised Distributor.

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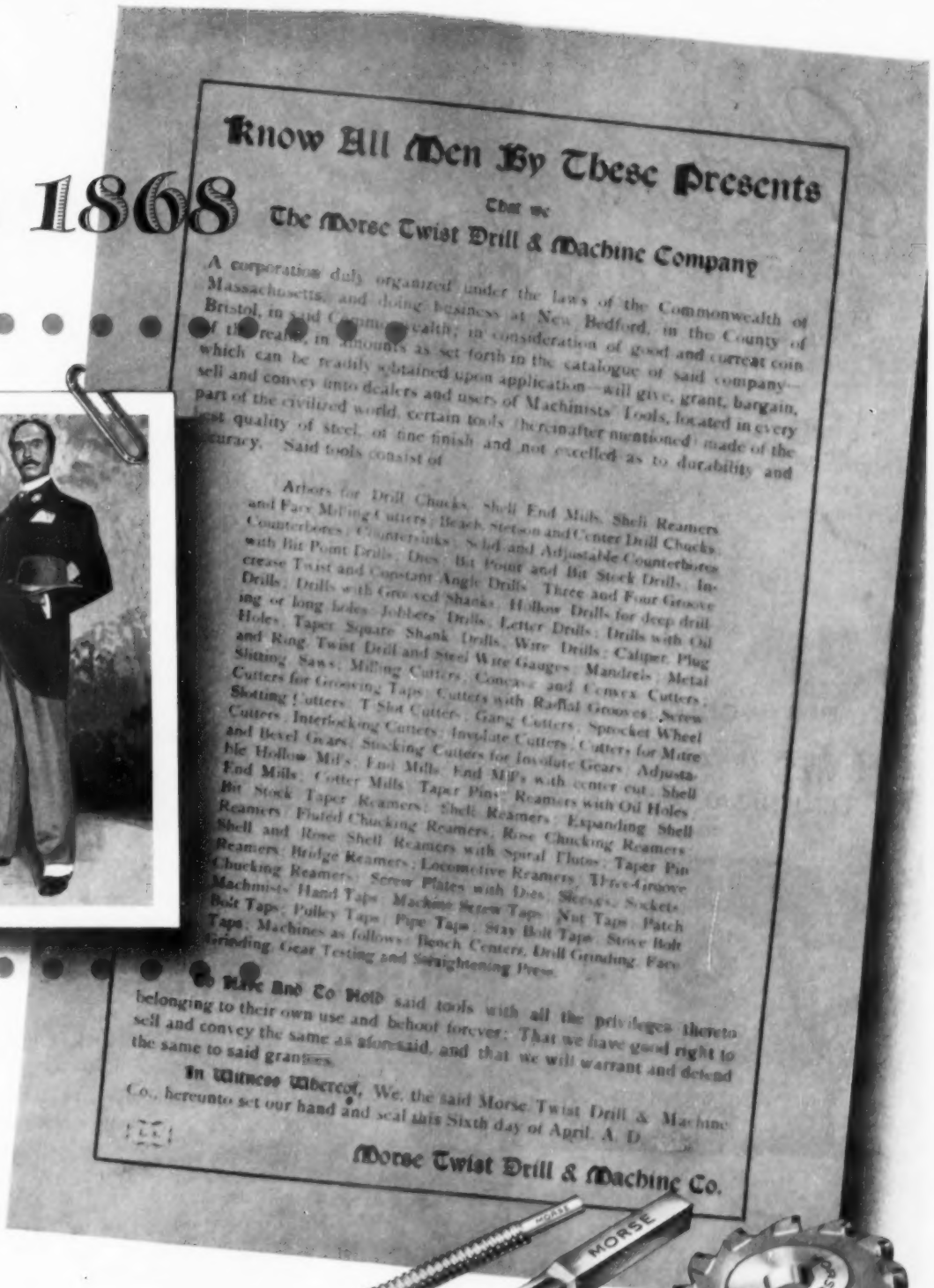
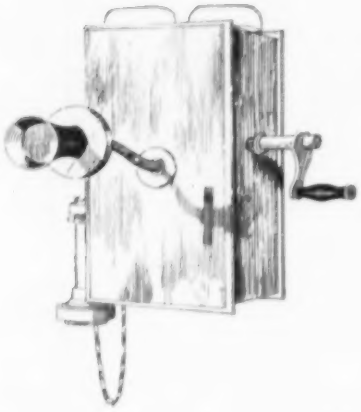

Know All Men By These Presents
That we
The Morse Twist Drill & Machine Company
A corporation duly organized under the laws of the Commonwealth of Massachusetts, and doing business at New Bedford, in the County of Bristol, in said Commonwealth; in consideration of good and current coin of the realm, in amounts as set forth in the catalogue of said company— which can be readily obtained upon application—will give, grant, bargain, sell and convey unto dealers and users of Machinists' Tools, located in every part of the civilized world, certain tools (hereinafter mentioned) made of the best quality of steel, of fine finish and not excelled as to durability and accuracy. Said tools consist of
Arbors for Drill Chucks, Shell End Mills, Shell Reamers and Face Milling Cutters; Beach, Stetson and Center Drill Chucks; Counterbores; Countersinks; Solid and Adjustable Counterbores with Bit Point Drills; Dies; Bit Point and Bit Stock Drills; Increase Twist and Constant Angle Drills; Three and Four Groove Drills; Drills with Grooved Shanks; Hollow Drills for deep drilling of long holes; Jobbers Drills; Letter Drills; Drills with Oil Holes; Taper Square Shank Drills; Wire Drills; Caliper, Plug and Ring Twist Drill and Steel Wire Gauges; Mandrels; Metal Slitting Saws; Milling Cutters; Concave and Convex Cutters; Cutters for Grooving Taps; Cutters with Raffal Grooves; Screw Slotting Cutters; T Slot Cutter; Gang Cutters; Sprocket Wheel Cutters; Interlocking Cutters; Involute Cutters; Cutters for Mitre and Bevel Gears; Stocking Cutters for Involute Gears; Adjustable Hollow Mills; End Mills; End Mills with center cut; Shell End Mills; Cotter Mills; Taper Pins; Reamers with Oil Holes; Bit Stock Taper Reamers; Shell Reamers; Expanding Shell Reamers; Fluted Chucking Reamers; Rose Chucking Reamers; Shell and Rose Shell Reamers with Spiral Flutes; Taper Pin Reamers; Bridge Reamers; Locomotive Reamers; Three-Groove Chucking Reamers; Screw Plates with Dies; Sleeves; Sockets; Machinists' Hand Taps; Machine Screw Taps; Nut Taps; Patch Bolt Taps; Pulley Taps; Pipe Taps; Stay Bolt Taps; Stove Bolt Taps; Machines as follows: Bench Centers, Drill Grinding, Face Grinding, Gear Testing and Straightening Press.
To Have And To Hold said tools with all the privileges thereto belonging to their own use and behoof forever: That we have good right to sell and convey the same as aforesaid, and that we will warrant and defend the same to said grantees.
In Witness Whereof, We, the said Morse Twist Drill & Machine Co., hereunto set our hand and seal this Sixth day of April, A. D.
Morse Twist Drill & Machine Co.

means "THE MOST"
in Cutting Tools

Great in its day...



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Now...

another significant advance in a great tool line

Heller "Job Tempered" Flat Ground Die Steel

Heller's new JOB TEMPERED Flat Ground Die Steel is a truly significant advance in the field.

For one thing, its analysis is recommended by a group of leading consulting metallurgists. For another, it is precision-ground to a smooth surface finish of 25 to 35 micro-inches with all surface defects and decarburization removed to save time and effort in tool making.

It's easy to heat-treat, too. For instance, Heller Oil-Hardening Die Steel will achieve a Rockwell C hardness of 64-65 when hardened within a temperature range of 1450°F. to 1540°F. And a similarly wide range applies to the Air-Hardening type. Simple tempering instructions are supplied with each piece, so the entire heat-treating process is non-critical and virtually foolproof. As a result, you are sure of getting all the benefits of JOB TEMPERED tools, dies, jigs and fixtures when they're made from this superior Heller Die Steel.

Check the Die Steel or Tool Steel you may be using now.

Then let us show you why Heller JOB TEMPERED Die Steel is more efficient and economical to use . . . and will turn out tools that will do the job better and last longer.

Here are the Facts!

Heller's new folio of JOB TEMPERED Flat Ground Die Steel will give you full information on sizes and types available, heat treating, applications, physical properties, etc.

Write today for your copy.

. . . the analysis recommended by leading consulting metallurgists for Job Tempered Tools and Dies

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HELLER TOOL CO., *America's Oldest File Manufacturer*
Newcomerstown, Ohio— A Subsidiary of Simonds Saw and Steel Co.

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"YOUR OUTSIDE TOOL ROOM"

Heller "Job Tempered" Tools

Die used for blanking round can ends. The Kennametal cut edge die is shrunk-fit in the steel case, as shown in sectional drawing (black represents Kennametal, while gray indicates steel).

Cut edge dies of KENNAMETAL* increase production 60 times or more

The performance of hundreds of can lid dies of various sizes made of Kennametal average 60 times more lids than produced with steel dies. These dies cover a range of sizes, including ends large enough for gallon cans. This means less downtime on the die presses, high production rates, and minimum maintenance costs.

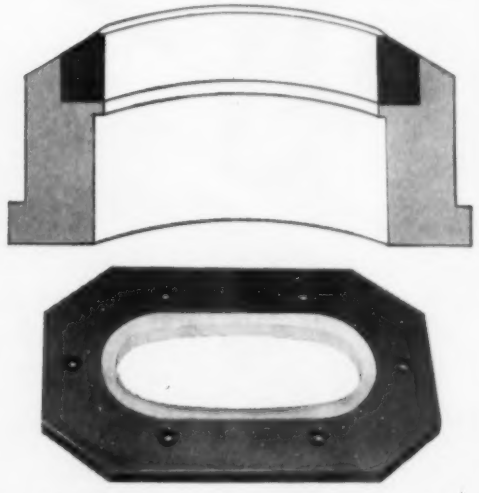
In one specific application, Kennametal dies and mating steel punches outperformed 35 previously-used steel die and punch sets before the first regrind was required. On another operation, nearly 800 million 3" lids had been produced by the time .020" of the stock had been ground from the original Kennametal cutting edge. These are typical examples of Kennametal cut edge die performance in plant after plant.

Choose Kennametal for your next die parts. With six grades in the "90 Series" and three grades in the exclusive "80 Series," for use where galling is a problem, there is a grade to meet the requirements of any die application.

A Kennametal die engineer will gladly work with you or your die maker in applying the correct grade of Kennametal for your dies. Call him at your nearest Kennametal office or write to KENNAMETAL INC., Latrobe, Pennsylvania.

*Trademark

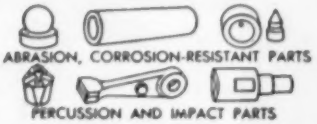
G-5052



A one-piece Kennametal cut edge die is shrunk and pressed into steel casing.

A combination of shrink-fit of Kennametal cut edge die and mechanical holding lugs is used on this die for blanking one-gallon turpentine can bottom pieces.

INDUSTRY AND KENNAMETAL ...Partners in Progress



IMPORTANT: For your convenience this sheet is perforated. Tear it out and "buck-slip" it to the proper man in your plant.

Centerless Grinding Wheels and Regulating Wheels by Carborundum are job-engineered. The *right* combination of abrasive grain and bond assures top operating efficiency. A typical centerless grinding sequence is reported on the back of this page. Compare these figures with yours.

Ask the man from **CARBORUNDUM** REGISTERED TRADE MARK **BONDED ABRASIVES DIVISION**

Also makers of a complete line of Coated Abrasives and Abrasive Grain

ATTENTION GRINDING FOREMAN: Turn the page and study the Product Performance Report written especially for you.

Newcomerstown, Ohio — A Subsidiary of Simonds Saw and Steel Co.

Product Performance Report

HYDRAULIC VALVE LIFTER BODIES

Millions of valve lifter bodies are required annually for the automotive industry. These precisely ground and finished parts are produced at rates as high as 3500 pieces/hr./machine. To produce these parts, which are finished to a size tolerance of .0003", wheels and machines must be right. Stock removal rates run the gamut, from .025"/pass and better in the roughing cuts to .0005"/pass in the finishing passes. Wheels must furnish maximum number of pieces per dressing and produce high quality work to close limits. A typical centerless grinding sequence for grinding valve lifter bodies before machining and heat treating follows:

Pass #1 24 x 6 x 12 WC465-P4-VD
14 x 6 x 5 A60-R2-R
Stock removal = .004 -.032"

Pass #2 Same wheels
Stock removal = .024"

Pass #3 24 x 6 x 12 A60-N5-V10
14 x 6 x 5 A80-R2-R
Stock removal = .015"

Pass #4 20 x 6 x 12 A60-N5-V10
12 x 6 x 5 A80-R2-R
Stock removal = .003"

PROVE IT YOURSELF. You can get the ***exact*** results you want in centerless grinding . . . in precision, rate of cut, and output. A complete survey of your operations will show you the specific grinding and regulating wheels you need.

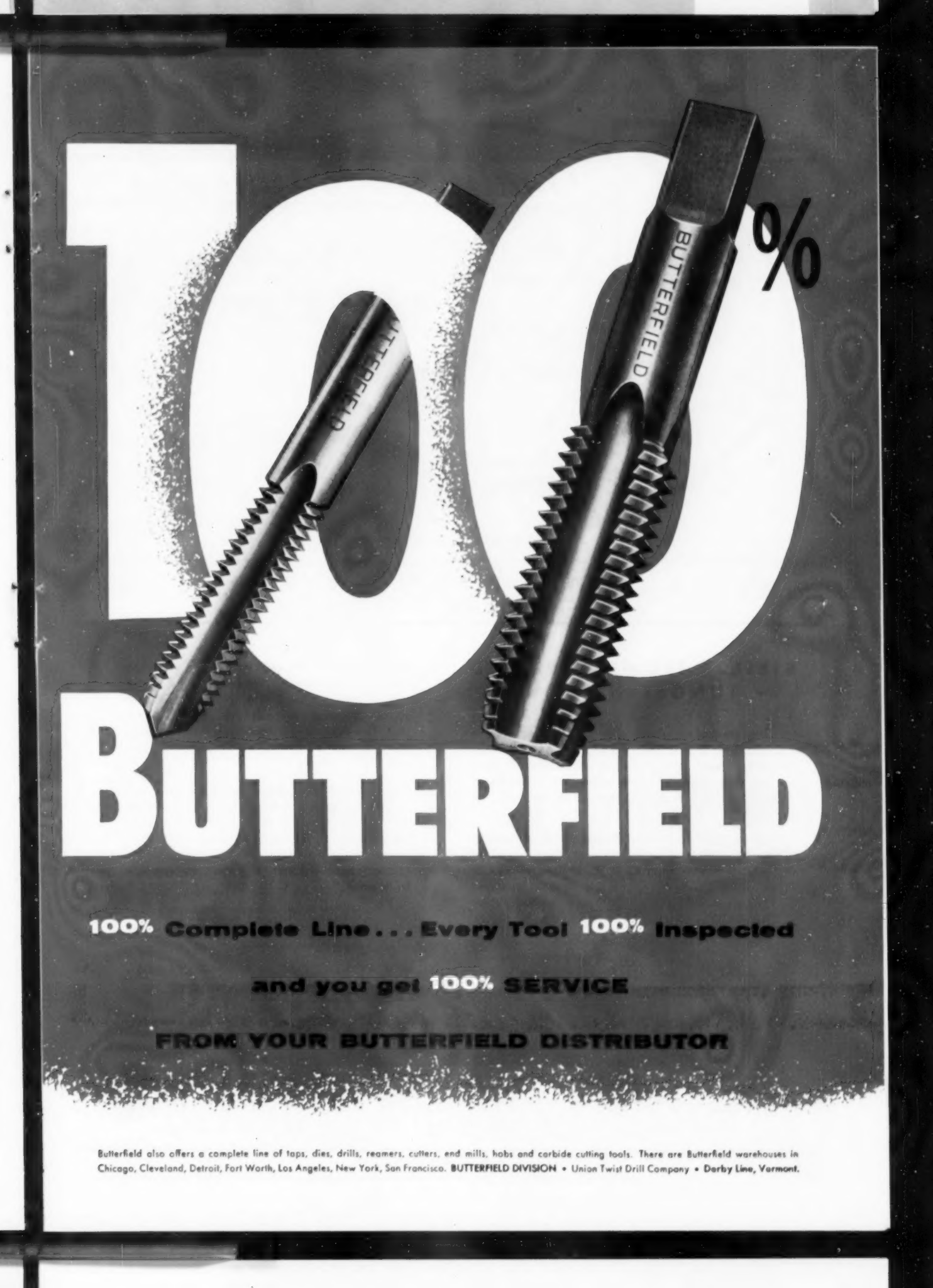
NOTE: Carborundum, leader in abrasive techniques, backs up its products with trained sales representatives, a staff of competent field engineers and an abrasive engineering laboratory . . . all available to you to put more sense in your abrasive dollar.

Here is another in the series of Product Performance Reports being released by the Bonded Abrasives Division of The Carborundum Company. A color photograph of this actual operation is shown on the back of this page.

• *Ask your local distributor . . . or the man from*

CARBORUNDUM
REGISTERED TRADE MARK

PRINTED IN U.S.A.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Butterfield also offers a complete line of taps, dies, drills, reamers, cutters, end mills, hobs and carbide cutting tools. There are Butterfield warehouses in Chicago, Cleveland, Detroit, Fort Worth, Los Angeles, New York, San Francisco. BUTTERFIELD DIVISION • Union Twist Drill Company • Derby Line, Vermont.

VK "Quality in Millionths"

VK WIRE TYPE PLUG GAGES
XXX TO ZZ ACCURACY

STEEL, CHROMIUM PLATED or TUNGSTEN CARBIDE

The illustration above shows three Van Keuren wire type plug gages, one of steel, one chromium plated, and one of tungsten carbide. All three are Class XXX, accurate within ten millionths of an inch. This is VK "Quality in Millionths".

You may not require tolerances of this order. Van Keuren wire type gages are available in standard tolerances also, from XX to ZZ, in sizes from .001" to 1.000", in steel, chromium plate or tungsten carbide, whichever material best suits your gaging job. Handles may be either Van Keuren or A.G.D. as preferred.

Notice also that VK units in all three materials are not only reversible but long enough to be cut off or cut in half, thus realizing from two to ten gages from each 1⅜" and 2" long unit. This extra length represents extra quality, extra saving, on every Van Keuren wire type unit your company buys.

VK wire type plug gages are fully described in Catalog and Handbook No. 36, available on request. The next time you need quality plug gages in a hurry, telephone The Van Keuren Co., Watertown, Mass. (WA 4-4394). In many cases we can ship your requirements from stock.

Send for a copy of the new, 258-page Van Keuren Catalog and Handbook No. 36 containing valuable technical and engineering information on measuring problems and methods. Address:

VK

38th YEAR

THE Van Keuren CO.,

174 WALTHAM STREET, WATERTOWN, MASS.

Optical Flats . . . Light Wave Equipment . . . Light Wave Micrometers
Gage Blocks . . . Wire Type, Taperlock and Trilock Plug Gages . . . Master Setting Disks . . . Thread Measuring Wires . . . Gear Measuring Wires
Carbide Plug Gages . . . Carbide Pivots . . . Precision Lapping Service

eliminate "cut and try" with Microbore...

...THE TOOL THAT ADJUSTS PRECISELY IN SECONDS!

YES, EVERY TIME—ALL THE TIME! In seconds, with our proven micrometer vernier adjustment, any operator who can read a "mike" can adjust a Microbore Tool for precision boring to extremely close tolerances.

Any production man knows what that means. Elimination of wasteful down time. Greater productivity of men and machines. Fewer rejects. Better parts due to holding closer tolerances.

It just makes good sense to *Modernize with Microbore.* A few dollars so invested can increase the productivity of a machine costing thousands.

Microbore units can also be applied in clusters for special tooling designed for high production applications.

A wide range of Microbore Boring Bars with NMTB taper, Morse taper, Flash-Change and Straight Shanks are available singly or in complete sets. Standard set includes Microbore units for each tool station, grinding blocks and necessary wrenches, in a fitted hardwood case.

As the first step in eliminating your own costly "cut and try" methods, write for Microbore Catalog No. 56.

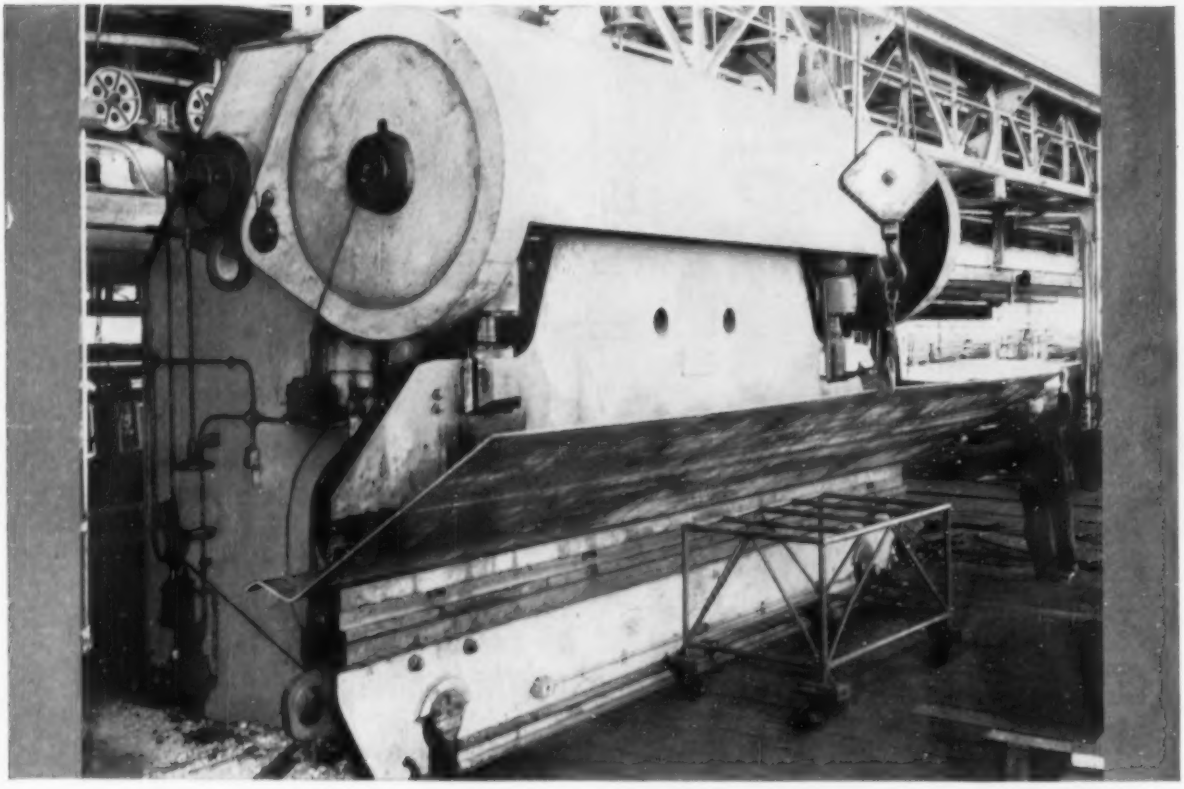
DeVlieg Microbore System

DE VLIEG MICROBORE • DIVISION OF DE VLIEG MACHINE COMPANY

2720 West Fourteen Mile Rd., Royal Oak, Michigan

U.S.S. KASKASKIA is typical of many ships which have had extensive bulkhead and other repairs at Moore Dry Dock Company.
Official U. S. Navy Photograph

Moore Dry Dock SPEEDS MARINE REPAIRS

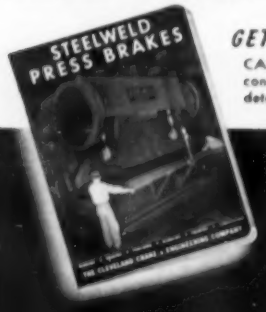


Fluted bulkhead plate being formed by Steelweld bending press in plate shop of Moore Dry Dock Company for bulkhead renewal job on U.S.S. "KASKASKIA" (A027). Size of plate: length 26', width 6', thickness ½".

Long a leading West Coast ship builder and marine repairs concern, the Moore Dry Dock Company, Oakland, California, has found a large Steelweld Bending Press to be a great asset in speeding the forming of heavy plate.

Ship repair, which constitutes an important part of the company's business, often requires replacement of large sections, such as bulkheads. This necessitates the forming of plates to various shapes to accurately replace those removed. Because of the power of their Steelweld and the ease of making adjustments, this work is carried on efficiently and satisfactorily.

The entire line of Steelwelds has an enviable reputation for continuous high-production performance. We urge you to get the facts on their many outstanding features.



GET THIS BOOK!
CATALOG No. 2010 gives construction and engineering details. Profusely illustrated.

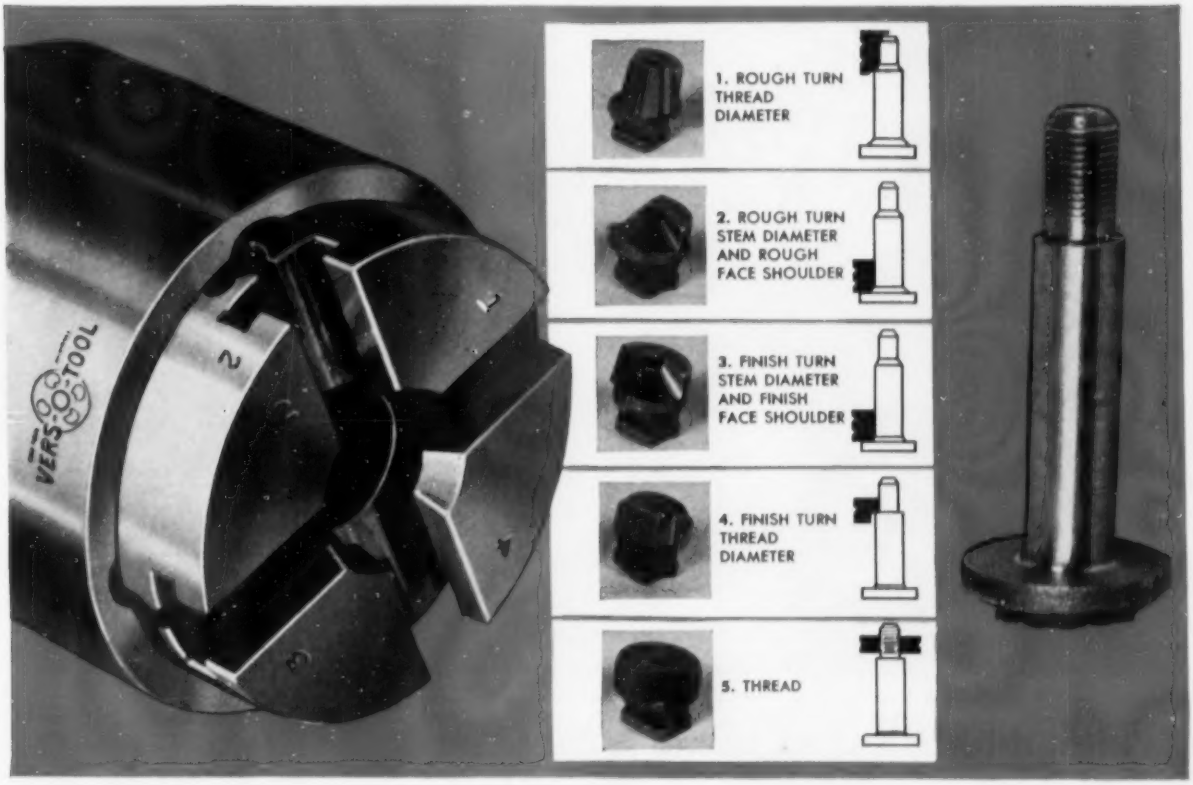
THE CLEVELAND CRANE & ENGINEERING CO.
8562 East 281 Street, Wickliffe, Ohio

STEELWELD
PRESS BRAKES
BRAKING • FORMING • BLANKING • DRAWING • CORRUGATING • PUNCHING

HERE'S HOW NAMCO VERS-O-TOOL

CUTS COSTS... SPEEDS PRODUCTION ON END TURNING AND FORMING

In this application 300 lever supports an hour are turned out on a vertical six-spindle automatic. Vers-O-Tool machines these steel forgings three times faster than single point tools, opens at the end of the cut, leaves no spiral marks on the work.


VERS-O-TOOL
1. ROUGH TURN THREAD DIAMETER
2. ROUGH TURN STEM DIAMETER AND ROUGH FACE SHOULDER
3. FINISH TURN STEM DIAMETER AND FINISH FACE SHOULDER
4. FINISH TURN THREAD DIAMETER
5. THREAD

Vers-O-Tool licks tough production problems because:

1 Basic Vers-O-Tool design permits cutters or ground thread chasers to be changed quickly without adjustment in the head.

2 All settings in the blocks are made in the tool-room with a micrometer gauge—no need for trial and error run after changing or grinding.

SEND FOR THIS CATALOG DT-52

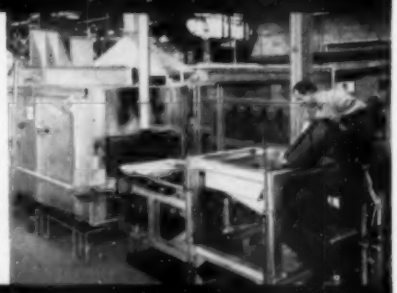
the National Acme company

184 EAST 131ST STREET • CLEVELAND 8, OHIO

carbon-stabilized

PARKER-KALON stress relieved socket screws

All P-K® Socket Screws are hardened in a propane atmosphere in this Westinghouse furnace to prevent carbon loss, eliminate adsorption of foreign gases. Part of P-K's controlled processing which assures consistent high quality, prevents precipitation or crystallization. Another good reason why . . . *If it's P-K . . . It's O-K!*



PARKER-KALON DIVISION, General American Transportation Corporation • Manufacturers of Socket Screws, Self-tapping Screws, Screwnails, Masonry Nails, Wing Nuts and Thumb Screws.

Sold Everywhere Through Leading Industrial Distributors — Factory: Clifton, New Jersey • Warehouses: Chicago, Illinois; Los Angeles, California

PARKER-KALON® fasteners

McKay ROLLER LEVELERS

. . . From Tin Plate to Ship Plate

Tin cans and super-tankers have more in common than cargo space — the flat steel of which they're made had to be roller leveled. Regardless of the product — cans, cars, planes, appliances or ships — more fabricators will tell you that the "buy-word" in roller levelers is McKay. Write for Bulletin 100, or call for a McKay Application Engineer today.

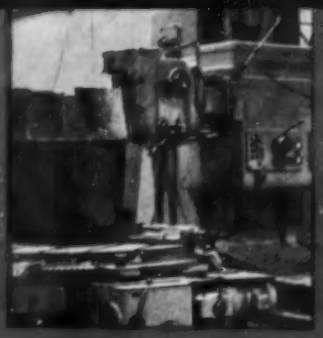
THE McKAY MACHINE COMPANY
Youngstown, Ohio

10036

McK

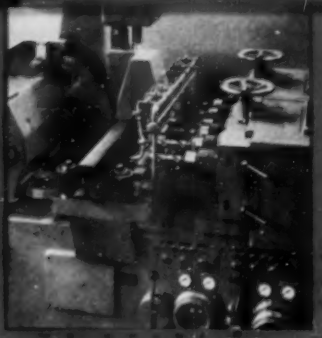
SETTING THE STANDARDS OF QUALITY METAL WORKING MACHINES FOR TWO GENERATIONS

WK — Semi-Automatic Models. Cutting capacity up to 27" Dia. Ask for catalog #44a.



WKU — Universal Foundry Saws. Maximum saw blade diameter 44". Ask for catalog #53a.

WKLM — Long Stroke Models. Maximum cube capacity 12" x 60". Ask for catalog #56a.



WKBB — Semi-Automatic BAND Sawing and Drilling Machines. Ask for catalog #41a.

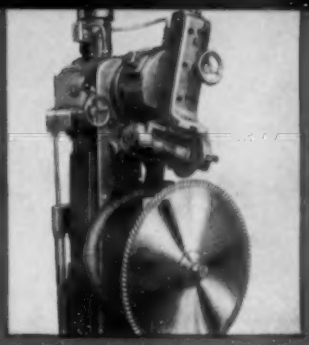
WAGNER + Specialization

MODEL WKA630
FULLY AUTOMATIC
COLD SAWING MACHINE

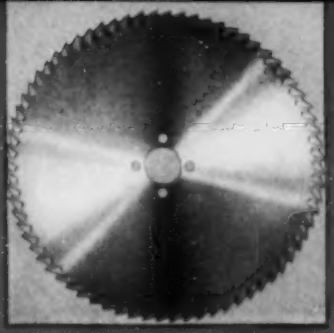
Illustrated here is one of the 43 cold sawing machines made by Wagner.

"KLINGELHOFER FOR MACHINE TOOLS"

New TWO POINT DRIVE reduces axial thrust and backlash. Facilitates sawing of SUPERALLOYS.



Automatic Saw Blade Sharpener. 3 Models with capacities 52" and 72". Ask for catalog #51e.



Original Wagner Segmental Saw Blades up to 71" Dia. Ask for catalog #58e.

Example of Wagner efficiency. Cuts 10" steel continuously at the rate of 25 per hour.

+ Automation = TOP OUTPUT

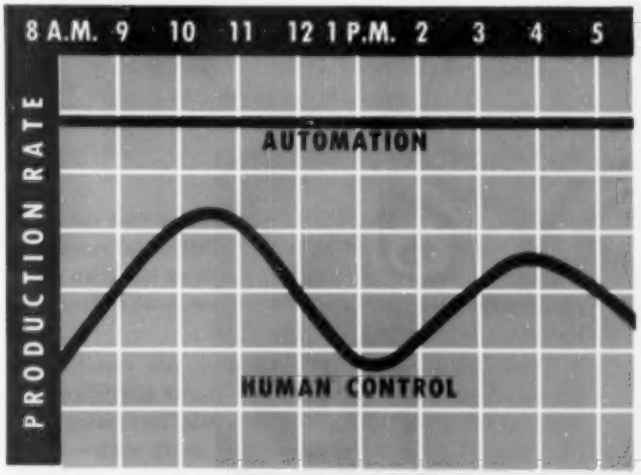
Wagner, the original name in hydraulic cold sawing machines, now offers automation plus specialization in the field of metal cutting. Circular sawing is a fast, economical method for cutting metals. Now it is taking its rightful place in automation with such well-established processes as milling, drilling, tapping, reaming, and boring.

A Wagner cold saw is the reliable starting point to such automation. Its efficiency will maintain your production peaks and its versatility permits the use of less expensive standard stock.

Let us know your problems. We will suggest the right machine to do your cutting job most efficiently. Write for details.

43 MODELS OF COLD SAWS to meet your requirements

Wagner, with a complete line of automatic, semi-automatic and specialized machines, covers the entire field of cold sawing of conventional alloy steels, including the stainless types. These models, with extended speed ranges, will efficiently cut a wide variety of the NEW SUPERALLOYS.



AUTOMATION OVER HUMAN CONTROL

As the above chart shows, AUTOMATION maintains Peak Production throughout the day — fatigue or slow starts do not influence your production schedule.

Albert
KLINGELHOFER MACHINE TOOL CORP.
Kenilworth, New Jersey

Some day every good lathe will feature

CONSTANT SURFACE CUTTING SPEED

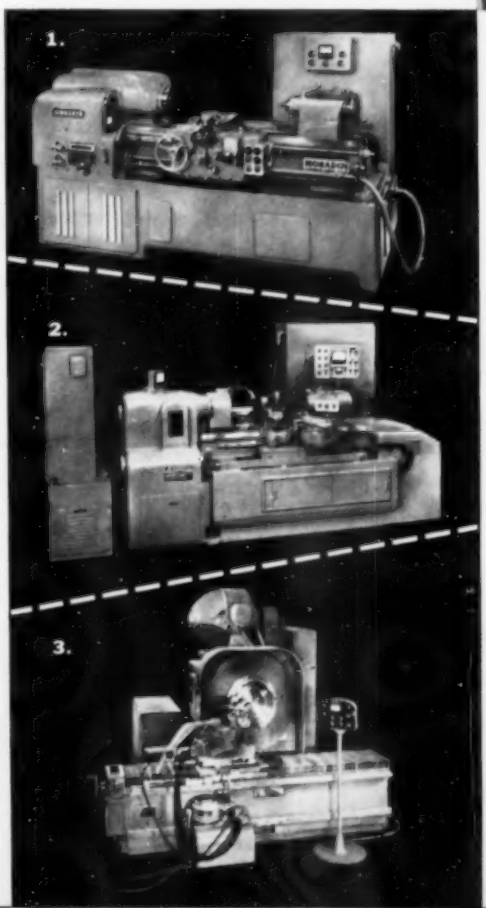
These Monarch Lathes have it now!

Monarch Series EE—Model 1000 **1.**

Monarch Model 21 Monamatic **2.**

Monarch Right Angle Lathe—Model F **3.**

Series 61 Engine and Toolmaker's / Models M, N and NN Heavy Duty \ **On special order**



Why buy obsolescence? Why buy a lathe that cut after cut, day after day can't deliver the full metal removing capacity built into it? Why buy anything less than optimum turning for today and tomorrow, both? Why buy less than Monarch?

There are plenty of reasons why you can bet on Constant Surface Cutting Speed. You've got your machine at full load throughout the cycle, increasing output from 30 to 40% on production shaft work—more on facing cuts and forgings. You're getting up to 50% more tool life, avoiding both the tool life loss of excessive speeds and the tool breakage and work distortion resulting from the increased tool forces caused by low speeds. And naturally, you get better finish and reduced power requirements.

Constant Surface Cutting Speed is the coming thing by all the laws of common sense and economics! Buy it now—buy it ahead—with Monarch . . . *The Monarch Machine Tool Company, Sidney, Ohio.*

Monarch

TURNING MACHINES

ACCURACY • ECONOMY • LONG LIFE

FOR A GOOD TURN FASTER . . . TURN TO MONARCH

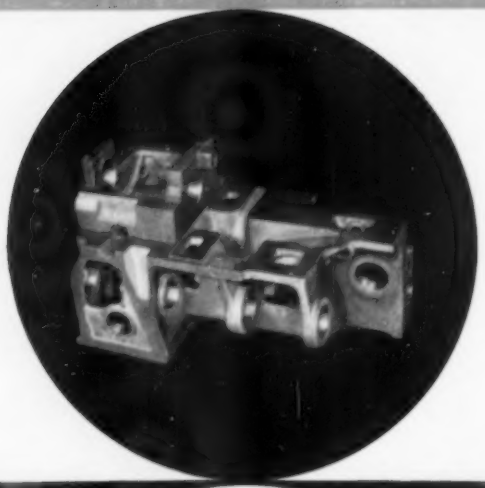
MONARCH DYNA-SHIFT LATHES

While Dyna-Shift construction does not provide Constant Surface Cutting Speed as such, it's a close approach to such an ideal—with less initial investment. Surface speeds are selected—or preselected—by dial. There is a much greater range and number of speeds. Speed shift is a matter of seconds and it's both automatic and foolproof. Look into the Dyna-Shift—with the headstock that thinks!

Monarch Series 62 Preselector Dyna-Shift

Monarch Series 80 Heavy Duty Dyna-Shift

Monarch Series 90 Heavy Duty Dyna-Shift



At Brown & Sharpe

Natcos Help From

At Brown & Sharpe, a 22-spindle Natco 3-way Machine handles finished drilling, boring and reaming on "00" screw machine beds

NATCO

Slash In-Process Time 16 Weeks to One Week

On Automatic Screw Machine Beds

Even on precise machine tool parts, traditionally handled on a "job-shop" basis, Brown & Sharpe gained great advantage by installing an automatic line. Prominent in the line are two Natcos, engineered and tooled to handle all drilling, boring and reaming on either the No. 00 or No. 2 automatic screw machine beds.

One Natco does all roughing—the second handles finishing. Total of 62 operations. Each Natco is tooled to process two parts at once—tooling is interchangeable to accommodate either sized bed.

Extreme machine tool accuracy must be maintained throughout. In one operation the Natco drills through five walls, holding centers parallel to the locating surface within .0015" for the full 42" distance. In another case, Natco engineering devised a tooling leaf that automatically drops through a core in the part, providing internal boring bar support.

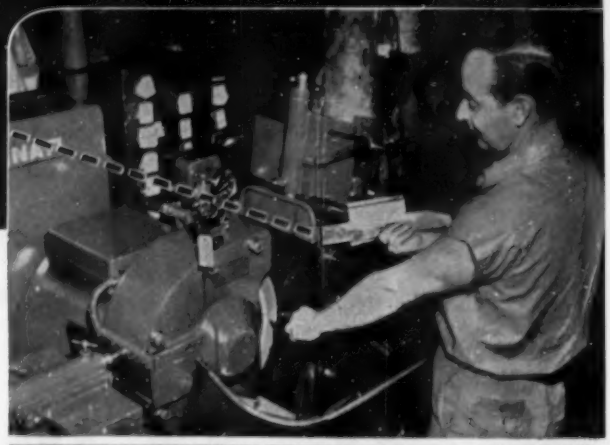
Natcos make sense even on "job-shop" jobs. Call in a Natco Field Engineer—he can quickly tell you whether a Natco can be a cost-saver on your next job.

National Automatic Tool Company, Inc.

Richmond, Indiana *Multi-spindle drilling, boring, and tapping machines. Special machines for automatic production.*

Call Natco Offices in Chicago, Detroit, New York, Buffalo, Boston, Philadelphia, Cleveland, Los Angeles; distributors in other cities.

Talide-Tipped Blades on the job for over 10 Years!



SPS

STANDARD PRESSED STEEL CO.
JENKINTOWN, PENNSYLVANIA

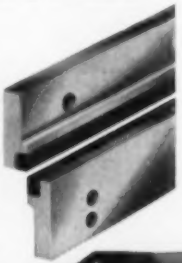
world's largest producer of socket screws, has been a regular user of Talide-tipped centerless grinder blades for the past 10 years. SPS centerless grinders are equipped with super-hard Talide centerless blades, enabling millions of precision parts to be centerless ground without downtime for blade changing, regrinds or replacements. The Talide carbide wear strip is produced by us in ONE SOLID SECTION UP TO 100" IN LENGTH WITHOUT SEAMS. A solid carbide wear strip has been proven more efficient than shorter sections brazed or butted together because the possibility of marking or scoring the work is eliminated.

TALIDE ROTARY KNIVES GIVE PHENOMENAL RUN OF 90-1...

A leading strip steel producer of razor blade, high-carbon, spring and stainless steel reports over 1200 coils were gang slitted with Talide knives compared to 15 coils with steel knives. More tonnage was produced in one regrind of the Talide knives than over the entire life of a set of steel knives. Burr-free, clean-cut edges produced with scrap rate practically eliminated.

$18,000 SAVED USING TALIDE SHEAR BLADES!

A large electric motor manufacturer shearing .014" silicon steel for transformers advises first year savings of $18,000 in blade costs after completely equipping their press line with Talide-tipped blades in lengths ranging from 15" to 87". Talide shear blades are averaging 1,000,000 cuts per grind compared to 10,000 cuts obtained with steel blades.



Over 50 sizes and styles of standard blades carried in stock—with special blades made promptly to order. Write for 76-page catalog 56-G or ask for sales engineer to call.

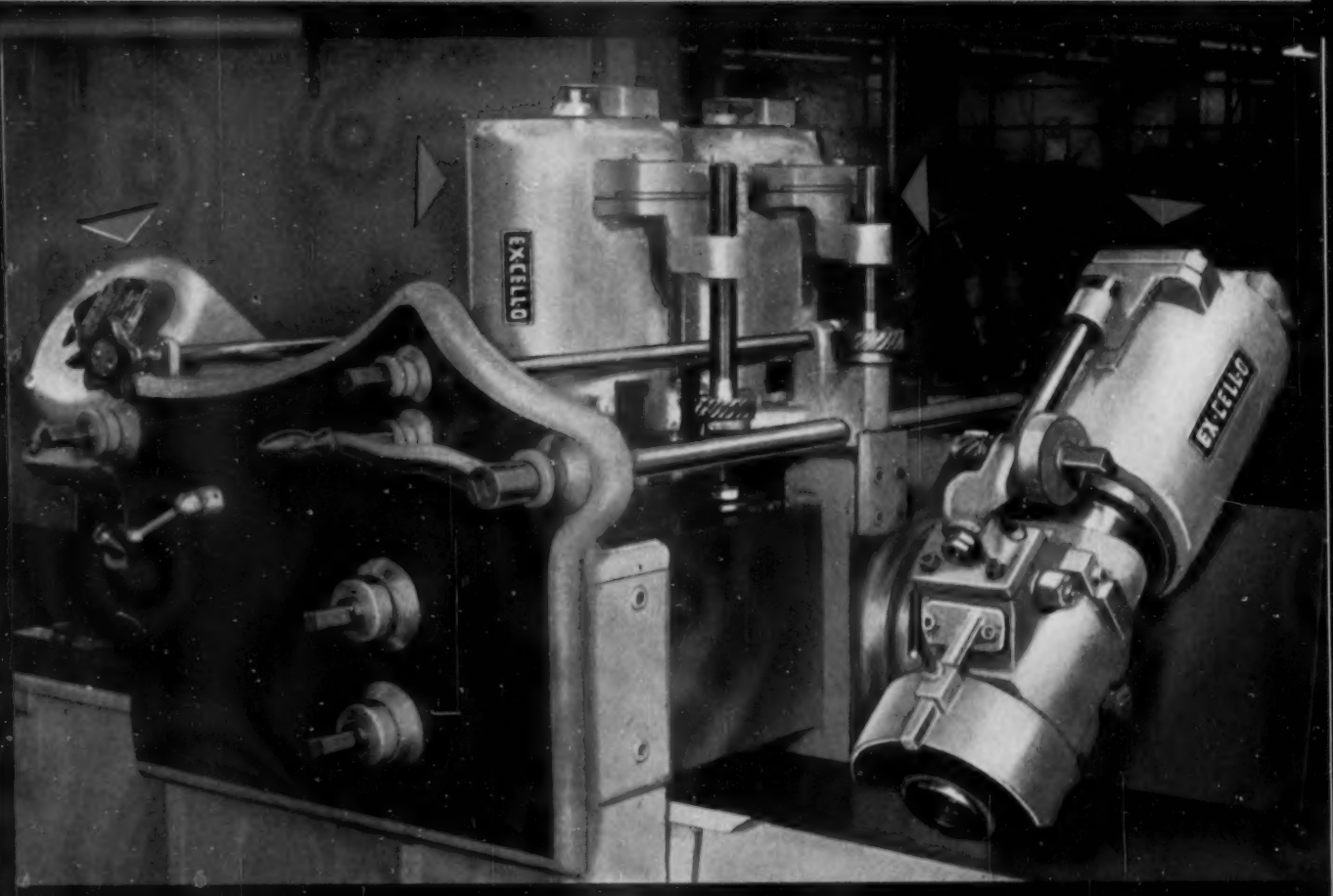
METAL CARBIDES CORPORATION
Youngstown 12, Ohio

EXCLUSIVE RETIPPING SERVICE

Because of its exclusive hot press method, Metal Carbides is able to rework worn, chipped out or broken areas of carbide-tipped blades back to original size and dimension with all breaks and defects eliminated.

METAL CARBIDES CORPORATION
TALIDE®
YOUNGSTOWN 12, OHIO

HOT PRESSED AND SINTERED CARBIDES • VACUUM METALS
HEAVY METAL • ALUMINUM OXIDE • HI-TEMP. ALLOYS
OVER 25 YEARS' EXPERIENCE IN TUNGSTEN CARBIDE METALLURGY



This Idea Multiplied Production by Two...

EX-CELL-O SPINDLES— AN INGENIOUS APPLICATION

A machinery builder in Kalamazoo, Michigan was faced with the problem of finish grinding both flat and angular dovetail ways on the column, knee and table of his vertical milling machines. Surface lengths varied from 9″ to 24″; tolerances on flat and parallel measure had to be within .001″ in 24″. Workpieces were gray iron sand castings.

Conventional way to do the job—an oscillating surface grinder to work each dovetail separately. Production men thought they could improve on convention. They built up their own machine from an old planer bed, added a bridge to support four Ex-Cell-O Precision Spindles and retained the standard planer feed.

The result: grinding both sides of four dovetail surfaces in one-pass planer fashion for a saving of roughly 50 percent in per unit cost. Perhaps you too have an operation which could be performed more economically by an Ex-Cell-O Spindle; or perhaps you simply want to use the most versatile, dependable and long-lived spindle money can buy. In either case, you'll want to get in touch with your nearby Ex-Cell-O Representative, or contact Ex-Cell-O direct.

57-23

Above, four standard Ex-Cell-O Precision Grinding Spindles are utilized to grind four surfaces of machine ways in one pass.

Standard, totally enclosed motorized surface grinder spindle is rated one horsepower at 3600 rpm. Also available in a range of higher horsepower.

XLO EX-CELL-O FOR PRECISION

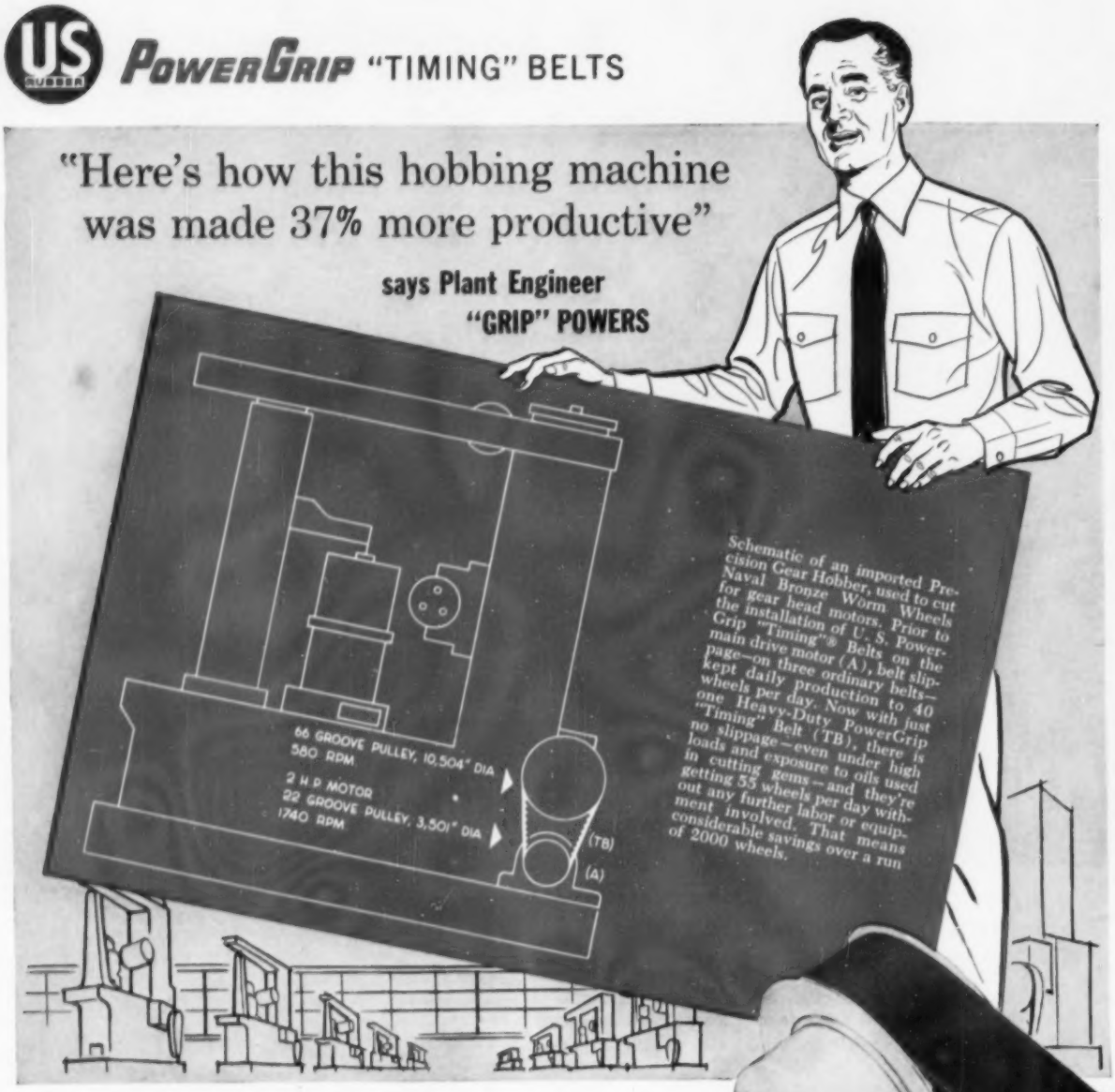
EX-CELL-O CORPORATION
DETROIT 32, MICHIGAN

MANUFACTURERS OF PRECISION MACHINE TOOLS • GRINDING SPINDLES • CUTTING TOOLS • RAILROAD PINS AND BUSHINGS • DRILL JIG BUSHINGS • AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT

PowerGrip "TIMING" BELTS

"Here's how this hobbing machine was made 37% more productive"

says Plant Engineer "GRIP" POWERS



Schematic of an imported Precision Gear Hobber, used to cut Naval Bronze Worm Wheels for gear head motors. Prior to the installation of U. S. PowerGrip "Timing"® Belts on the main drive motor (A), belt slippage—on three ordinary belts—kept daily production to 40 wheels per day. Now with just one Heavy-Duty PowerGrip "Timing" Belt (TB), there is no slippage—even under high loads and exposure to oils used in cutting gems—and they're getting 55 wheels per day without any further labor or equipment involved. That means considerable savings over a run of 2000 wheels.

"Grip" Powers is showing you a true story of how one East Coast gear manufacturer utilized the unique ability of U. S. PowerGrip "Timing" Belts to step up production. It's just one of many examples of how U. S. PowerGrip "Timing" Belts simplify and improve a power transmission unit.

For the design of hand tools, drill presses, saws, electric typewriters—from fleapower to 1,000 horsepower—get U. S. PowerGrip "Timing" Belts.

These belts—plus expert engineering service—are obtainable at the 28 "U. S." District Sales Offices, "U. S." power transmission distributors, or contact us at Rockefeller Center, New York 20, N. Y. In Canada, Dominion Rubber Co., Ltd.

U. S. PowerGrip "Timing" Belts offer all these advantages:

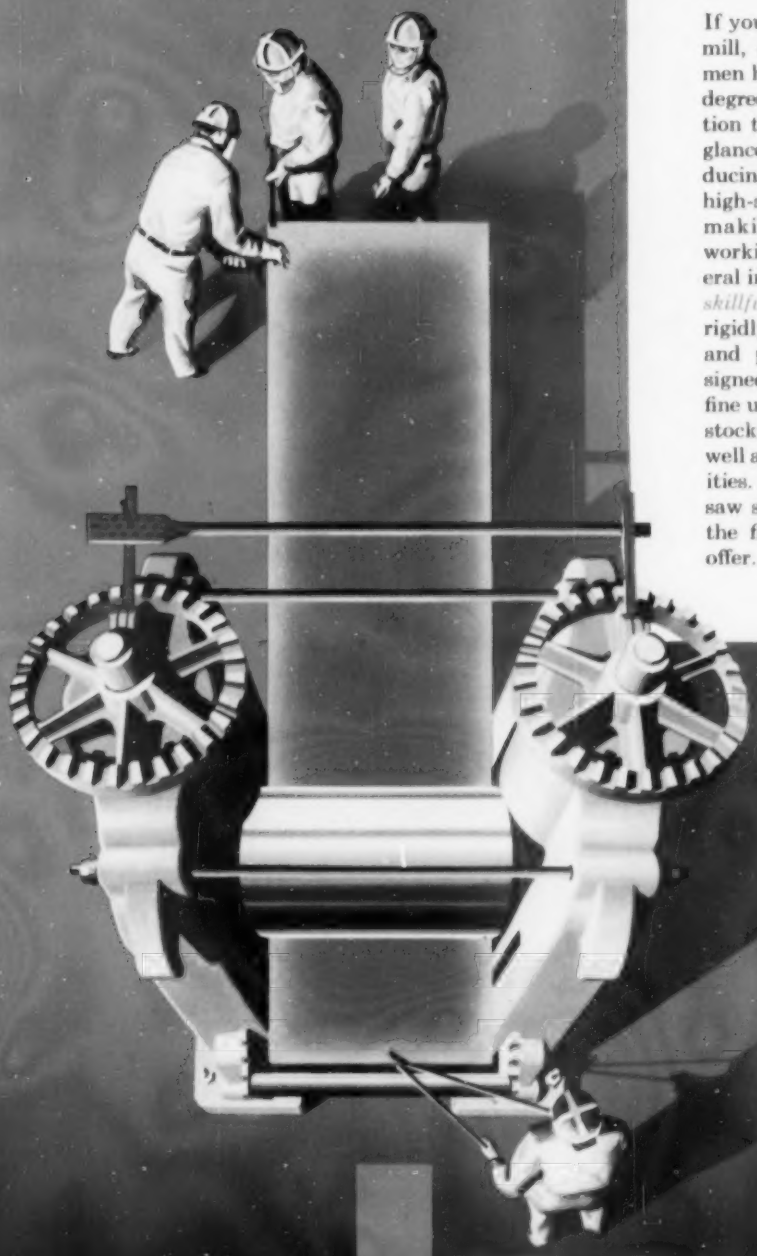
- close to 100% efficiency.
- constant angular velocity.
- imbedded with steel cables for high tensile strength.
- no slippage, no take-up—allows short centers, high ratios.
- absence of metal-to-metal contact—eliminates need for lubrication and housing devices.
- handles speeds up to 16,000 F.P.M. or so slow as to be imperceptible to the eye.

Visit our Booth #822, Design Engineering Show, New York Coliseum, May 20-23

Mechanical Goods Division

United States Rubber

How Jessop skill makes better saw steel



If you could peer down into the Jessop mill, chances are you'd see groups of men hand-rolling sheets of steel with a degree of skill and careful concentration that might seem excessive at first glance. *Yet it isn't.* These men are producing a very special steel—top quality high-speed sheet which is used in the making of hack-saw blades, woodworking tools, metal-slitting saws, general industrial knives, and the like. But *skillful finish rolling isn't all.* Jessop rigidly controls its melting formulas and pours small ingots specially designed for cross rolling. This insures a fine uniform grain structure so that the stock blanks well, forms well, swages well and has superior edge holding qualities. Remember, when you order your saw steel from Jessop, you are buying the finest that Jessop experience can offer. *And that's mighty fine steel.*

JESSOP

STEEL COMPANY · WASHINGTON, PENNSYLVANIA

OFFICES IN PRINCIPAL CITIES

Jessop Steel of Canada Limited, Wallaceburg, Toronto

Jessop Steel International Corp., Chrysler Building, New York, New York

A Multipress case study

Small lot production of intricate electronic parts is performed quickly and economically on this Denison hydraulic Multipress.

MULTIPRESS® speeds electronic parts assembly at General Radio

The Problem: Planning a production set-up for a company that averages a new, complex electronic instrument every month, in production lots ranging from 50 to 100,000 units.

The solution: Denison's versatile hydraulic Multipress.

General Radio Company of Cambridge, Mass., a leading designer and manufacturer of electronic test equipment, finds Multipress capable of automatic operations on volume runs, yet efficient when manually operated for small lots.

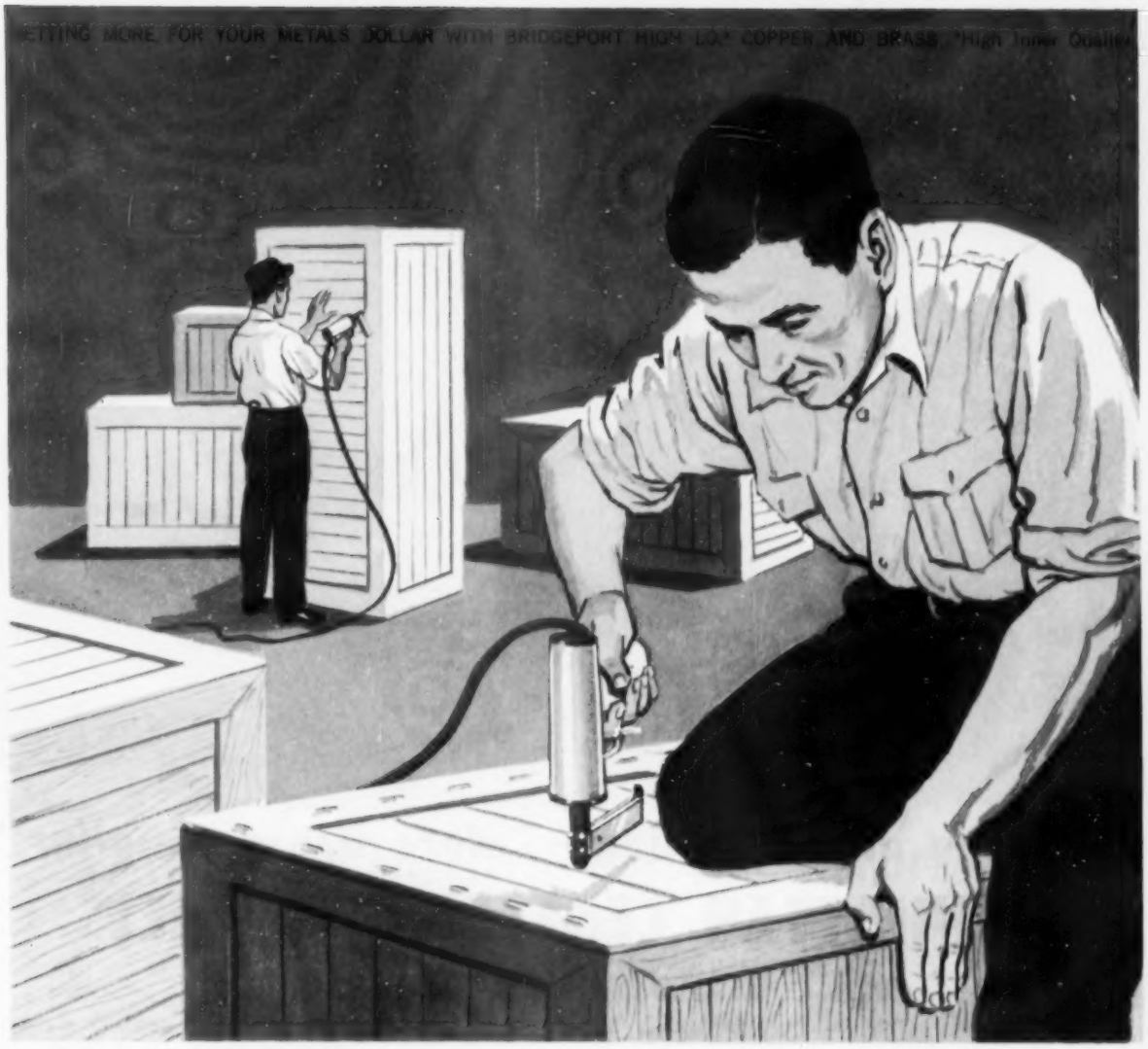
Small lot production costs have been reduced substantially. Operator safety is at peak levels. Smooth, precise pressure control produces uniform assemblies despite thickness variations in stock materials.

These Multipress benefits are typical. To find out how Denison hydraulic power can lower costs, speed production and improve quality for your company, consult a Denison hydraulic specialist. Write Denison Engineering Division, American Brake Shoe Co., 1182 Dublin Road, Columbus 16, Ohio.

DENISON HydrOILics

HYDRAULIC PRESSES • PUMPS • MOTORS • CONTROLS

Jessop Steel International Corp., Chrysler Building, New York, New York



BRIDGEPORT BRONZE AND BRASS:

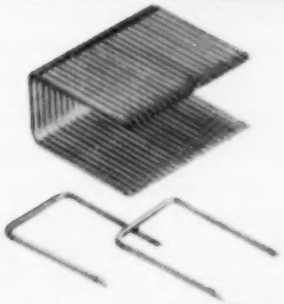
Best "Ammunition" For Stapling Gun

California Wire Products Company, Inc., Visalia, California, manufactures air-operated staplers for a variety of crating and assembly applications; wood-to-wood, sheet metal to wood, roofing, wall paneling, etc. Often, many of these applications are subject to fresh and salt water corrosive attack.

Solving both corrosion problems required two Bridgeport alloys with suitable anti-corrosive properties and workability. Calwire's staple-cutting and forming machines are specially designed, and "alloy adaptability" to their production methods is a prime factor.

Bridgeport Yellow Brass Wire #16 with a tensile strength of 65,000 to 80,000 psi in diameters of .0625" and .080" is used for staples that must withstand fresh-water corrosion. Bridgeport Duronze #609 (Silicon Bronze) Wire with a psi of 80,000 to 100,000 and diameters of .0625" and .080" is used when salt-water corrosion is present.

This is another example of how Bridgeport meets specific problems—unique and common—with one or more of its long list of *standard* alloys. Call your nearest Bridgeport Sales Office today—there's one near you.

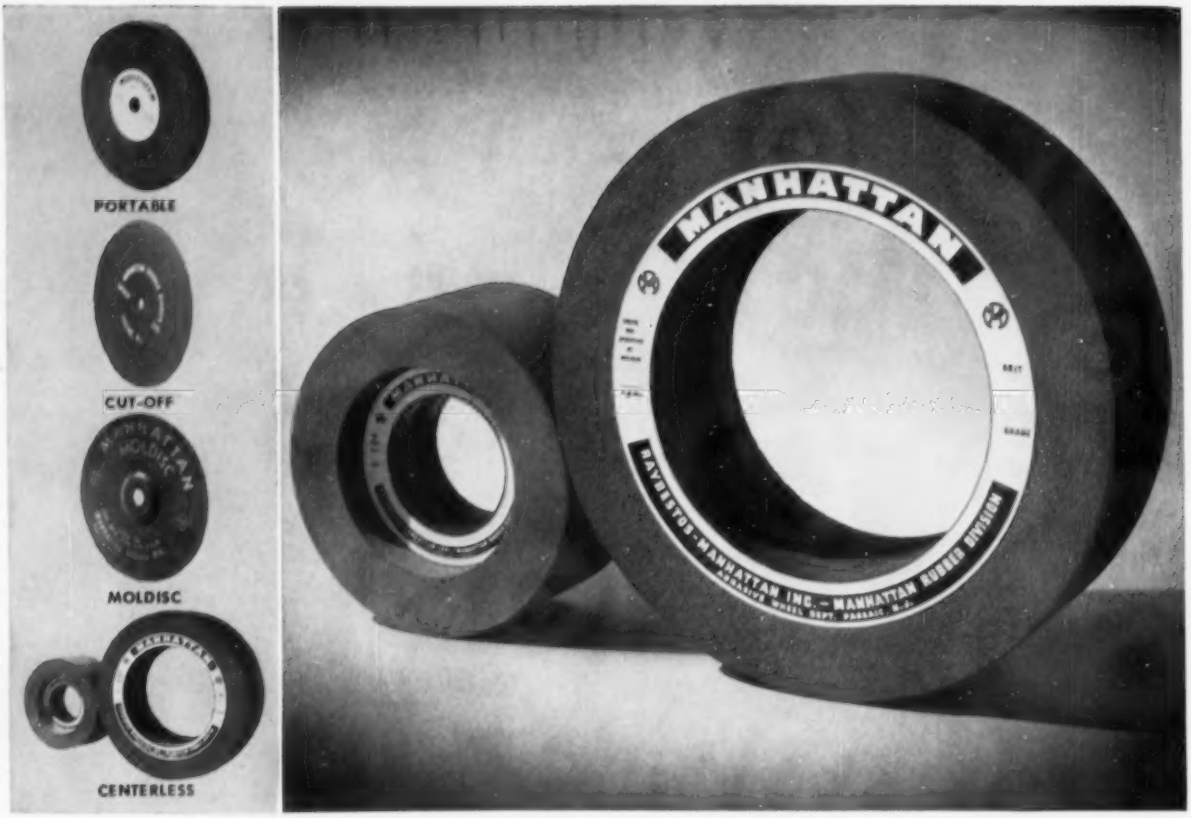


matched
Bridgeport Brass Alloys
to your job

BRIDGEPORT BRASS

Offices in Principal Cities • Conveniently Located Warehouses

Bridgeport Brass Company, Bridgeport 2, Connecticut
In Canada: Noranda Copper and Brass Ltd., Montreal



Roughing and Finishing—"*More Use per Dollar*"

MANHATTAN CENTERLESS WHEELS

The same Manhattan Centerless Wheel used for roughing can be used for finishing — simply by controlling the feed rate and the amount of stock removed! To do *both* jobs efficiently — at top grinding speeds — Manhattan Centerless Wheels are specially bonded. They have a higher grit-carrying rubber bond that insures maximum metal removal with *every* pass . . . permits *fewer* passes to obtain stock removal to required tolerances and desired finishes — even with coarse grained abrasives! The greater strength built into these wheels also permits higher speed grinding — up to 8500 sfpm! You get more production at lower cost . . . "More Use per Dollar" with Manhattan Rubber Bond Centerless Wheels and Regulating Wheels.

Manhattan Centerless Wheels and Regulating Wheels are custom-made for your specific job requirements. Regulating Wheels are supplied either plain or core-mounted. Manhattan Core Mountings also result in substantial savings. Let a Manhattan representative show you how Manhattan Centerless Wheels and other high speed, heavy duty abrasive wheels do a *better* job, *longer* . . . give you "More Use per Dollar."

RM742

WRITE TO THE ABRASIVE WHEEL DEPARTMENT

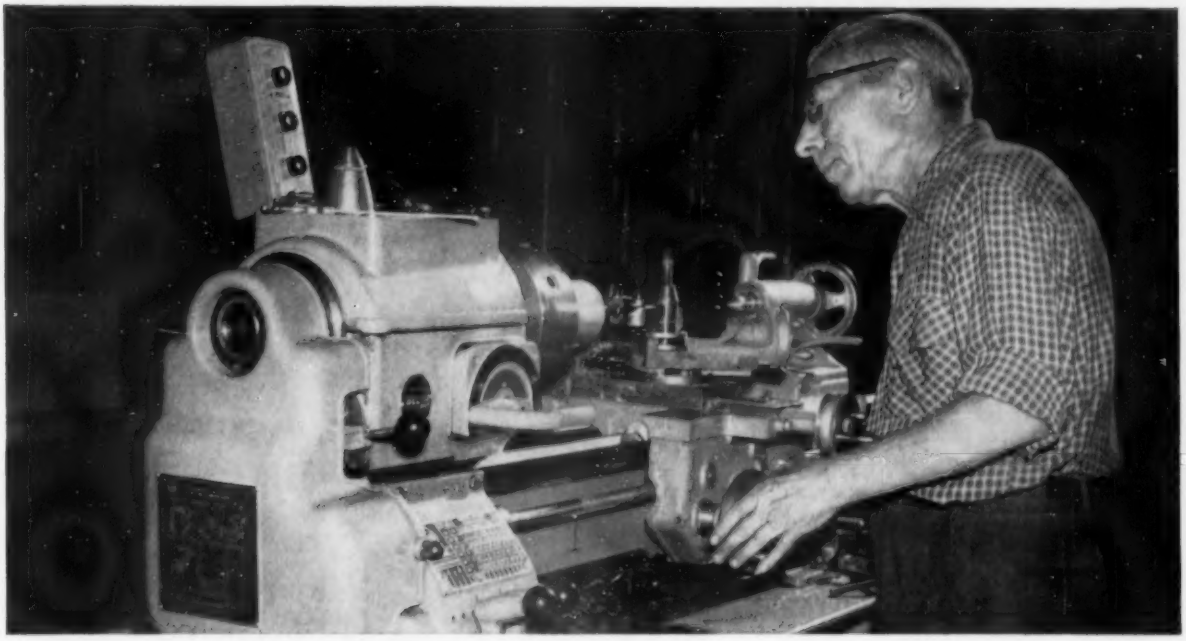
MANHATTAN RUBBER DIVISION—PASSAIC, NEW JERSEY

RAYBESTOS-MANHATTAN, INC.

Belts • Hose • Roll Covering • Tank Linings • Industrial Rubber Specialties • Abrasive and Diamond Wheels • Brake Blocks and Linings • Clutch Facings • Asbestos Textiles • Mechanical Packings • Engineered Plastics • Sintered Metal Products • Industrial Adhesives • Laundry Pads and Covers • Bowling Balls

ROCKWELL-BUILT

DELTA 11" metalworking lathe



"You can't beat it for precision work"

say Sam and Charles Lentini, Co-Owners, Jacy Manufacturing Co., Brooklyn, N.Y.

ACCURACY TO 0.0003 INCH. The Lentinis use their Delta 11" Lathe to machine precision instrument parts and components for the aeronautical and electronics industries where extremely close tolerances are demanded. Their Delta meets these exacting demands down to plus-minus 0.0003-inch tolerance. Sam Lentini points out that the lathe's L-00 tapered key drive chuck insures a positive grip on the work.

SHIFTS OPERATIONS QUICKLY. With their Delta 11" lathe, the shift from turning or boring to threading or tapping is done with complete ease. There's no time lost in changing set-ups. "The big, legible dials on the Delta lathe make precision machining fast and easy," explains Charles Lentini.

CONSISTENT QUALITY. Jacy men get the same high quality results in metals ranging from brass to titanium—in lots as large as 30,000 or small as 10. As Sam Lentini points out, "For doing precision work in small lots or large, you can't beat the Delta 11" metalworking lathe."

PAYS ITS OWN WAY. "In a shop like ours with a variety of work, every tool must be versatile enough to pay its way on every job," says Charles Lentini, "and *we have yet to find a precision job that our 11" Delta couldn't do.*"

SEE THE ENTIRE DELTA 11" METAL LATHE LINE. **Compare—and make up your own mind. Your Dealer is listed under "Tools" in the Yellow Pages of your phone book.**

Send coupon for all the facts!

DELTA ROCKWELL

another product by **ROCKWELL**

Delta Power Tool Division, Rockwell Manufacturing Co.
620E N. Lexington Ave., Pittsburgh 8, Pennsylvania

☐ Please send Delta Industrial Catalog on entire Delta 11" Metal Lathe Line.

☐ Please send name of my nearest Delta Dealer.

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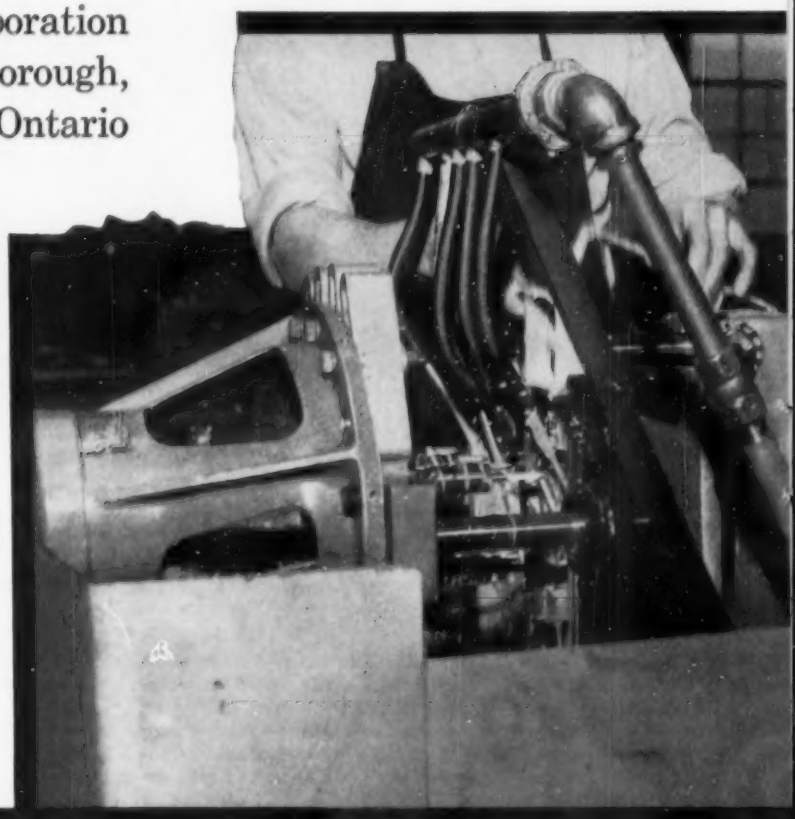
Stuart

DASCO

SUPER SOLUBLE BASE

At Outboard Marine Corporation of Canada Ltd., Peterborough, Ontario

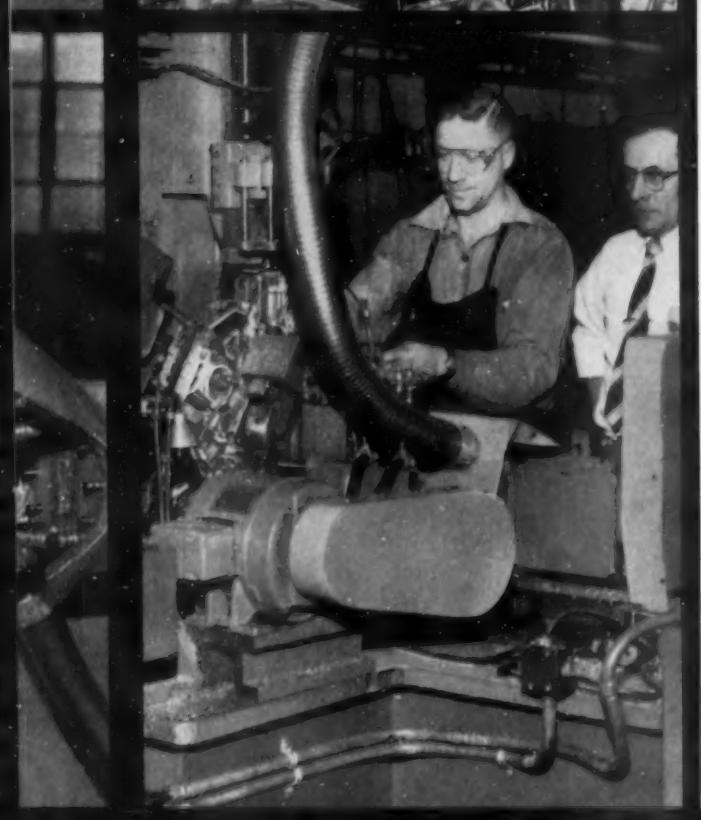


You can reduce tap breakage, cut down on scrap, and increase production the way this company did by using Stuart's Dasco Super Soluble water-mix base cutting fluid. Tap breakage and pulled threads recurring when machining aluminum alloy castings were causing high costs and slowing production of Evinrude, Johnson, and Elto outboard marine motors, Lawn-Boy power lawn mowers, and other products manufactured in this Canadian plant. Switching to Dasco Super Soluble Base immediately ended the high scrap problem, stopped tap breakage, and reduced downtime for replacing broken tools. Accuracy and finish improved on jobs similar to the one pictured at the right, where 20 pitch screw threads are tapped in 75 aluminum alloy gas tank covers every hour on a horizontal Magna drill.

Fills the gap between conventional soluble oils and straight cutting oils on difficult jobs like these

Due to machine design and splashing problems, a straight cutting oil could not be used on these operations at Outboard Marine. Thus, a true heavy-duty soluble oil, with superior lubricating characteristics to reduce heat generation, was the best answer to trouble-free machining.

Dasco Super Soluble has a sulpho-chlorinated fatty oil base which lubricates the cutting edge and aids chip formation . . . improves performance on many heavy-duty jobs too tough for conventional soluble oils —jobs such as cold nose boring of steel artillery shells . . . turning, milling, drilling, and grinding farm machinery parts . . . boring, reaming, and tapping mortar bombs . . . centerless grinding washing machine drive shafts . . . threading and turning B-1113 steel rod . . . and turning seamless steel forged tubes. If you have similar operations that are too tough for ordinary "coolants," why not call your Stuart sales engineer for a test run on Dasco Super Soluble Base.



Nine 32 pitch screw threads are tapped in a single setup in aluminum alloy silencers for Outboard Marine's 35 hp outboard motors at the rate of 100 per hour. A relatively rich mixture of 12 parts water to one part Dasco Super Soluble Base is used to control quality and costs.

ENDS TOOL BREAKAGE AND HIGH SCRAP LOSSES

This was the job (left) that really proved the effectiveness of Stuart's Dasco Super Soluble Base, which is applied in a fine spray blanketing the entire work area. It's a special-purpose machine, designed and built by Outboard Marine engineers, and replaced three units formerly required to machine crankcases for gasoline engines on power lawn mowers and snow blowers. In a single setup, it bores a hole in the piece, inserts a bushing, turns and faces both ends, taps seven holes, and drills six oil holes. Production rate is 38 finished pieces per hour with a tolerance of plus or minus .0005 in. on the bored diameter. Formerly, shutdowns to replace either broken drills or taps really put a crimp in production; but, since the changeover in cutting fluids, this machine has performed in outstanding, trouble-free fashion.

Phone your
Stuart Service Center

Arrange now to test Stuart's Dasco Super Soluble Base on your difficult cutting and grinding jobs.

DETROIT, MICH. ..... Tyler 7-8500
CHICAGO, ILL. ..... Bishop 7-7100
HARTFORD, CONN. ..... Jackson 7-1144
CLEVELAND, OHIO ..... Prospect 1-7411
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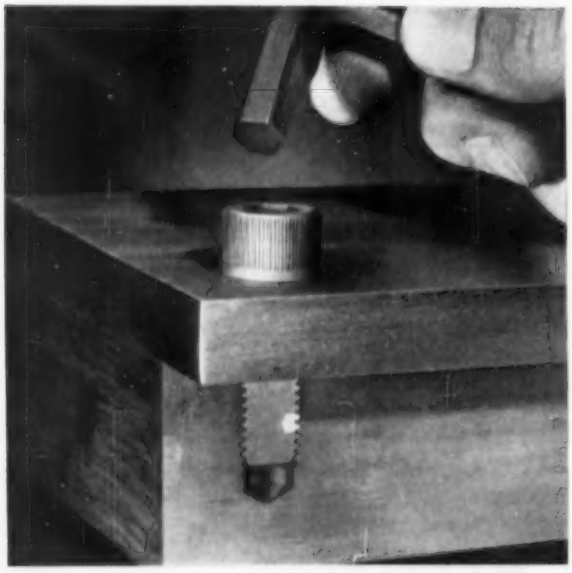
Stuart

METALWORKING LUBRICANTS

The ordinary fasteners securing the worm wheel to the drum shaft in this automatic screw machine loosened, causing $120 worth of damage to parts. Labor for the repair job cost $100. The ordinary fasteners were replaced with self-locking UNBRAKOS, and there has been no trouble since.

Vibration won't loosen self-locking UNBRAKO socket cap screws



HOW IT LOCKS. The tough, resilient Nylok locking pellet keys itself into the mating threads. It forces threads together and locks the screw securely—whether or not the screw is seated.

UNBRAKO socket screws with the Nylok* self-locking device eliminate fastener problems caused by vibration.

Take the drive system in the automatic screw machine illustrated above, for example. The screws originally used to secure the worm wheel to the drum shaft loosened, causing considerable damage, besides loss of production time. These have now been replaced with self-locking UNBRAKO socket head cap screws and the trouble has been eliminated.

An UNBRAKO socket screw with the Nylok self-locking device is a single unit. Just screw it into any tapped hole. Seated or not, it locks positively wherever wrenching stops. Constant vibration or endless running of a machine won't affect these self-locking UNBRAKOS. The screws will not work loose!

Write today for your copy of Form 2193, which gives catalog and technical data on the complete line of UNBRAKO socket screws with the Nylok self-locking device. Or see your local industrial distributor. Unbrako Socket Screw Division, STANDARD PRESSED STEEL CO., Jenkintown 37, Pa.

UNBRAKO SOCKET SCREW DIVISION

STANDARD PRESSED STEEL CO.

SPS

JENKINTOWN PENNSYLVANIA

*T.M. Reg. U.S. Pat. Off., The Nylok Corporation

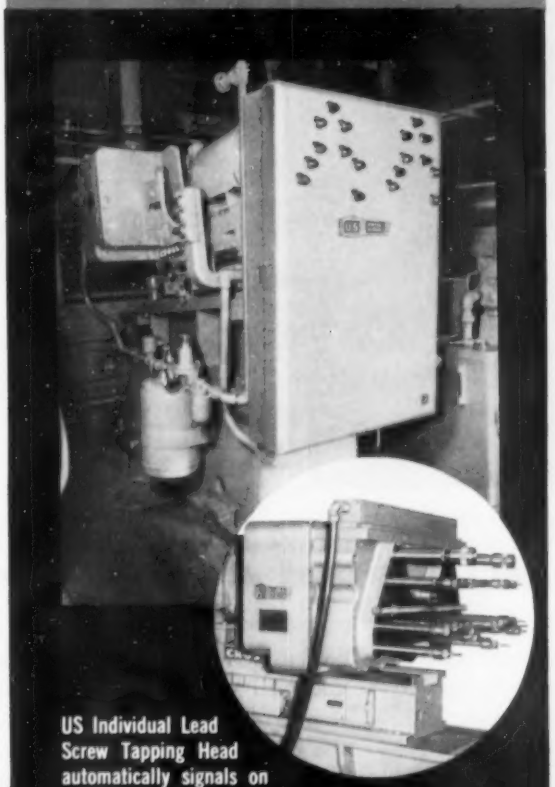
U. S. NAVY PHOTO

Trouble Spotter...

This majestic cruiser is a U. S. Navy airship. Its mission is locating trouble—*ahead of time*. How effective its deadly purpose in convoy is attested by the fact that "no vessel escorted by a blimp in World War II was sunk by an enemy submarine." Its invaluable contribution to our Aircraft Early Warning system is also firmly established. It is a Navy "tool" that virtually eliminates surprise.

The U. S. Drill Head Co.'s new electronic device seeks trouble too—in automated production lines. It locates faulty machining during a "transfer setup" and stops the machine *before* succeeding operations are begun. It minimizes the chance of costly smash-ups and resulting expensive down-time . . . reduces re-operating and scrap-loss costs.

This development is another precision cost-reducing "tool" from the largest exclusive drill head builder in the world.



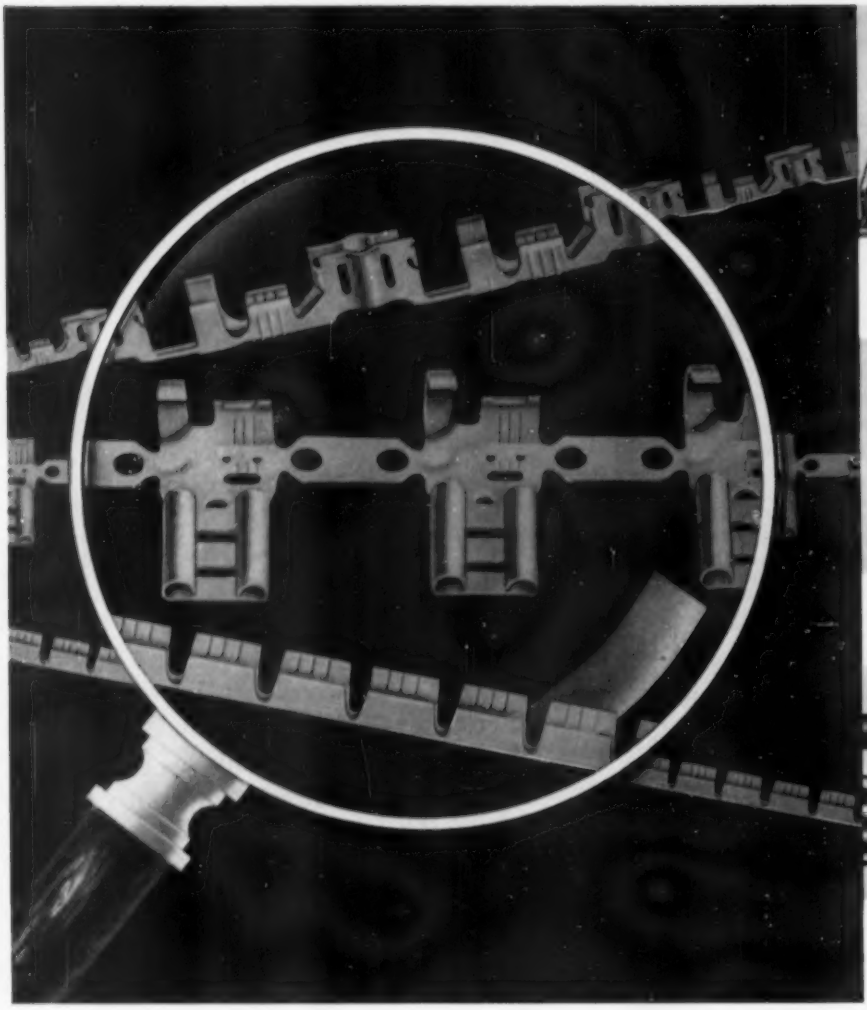
US Individual Lead Screw Tapping Head automatically signals on a light panel exact location of any spindle not tapping to full depth, and stops the entire line. In addition, patented US Safety Tap Spindles prevent all tap breakage due to dull taps or improperly drilled holes. Installed on transfer machines, this exclusive US development provides dual automatic protection during tapping without need for an extra probing station.

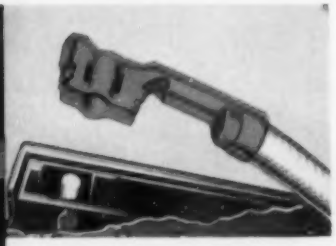
We manufacture all types of adjustable, fixed center and individual lead screw tapping heads. Ask us to help solve your multiple drilling and tapping problems.

US DRILL HEAD

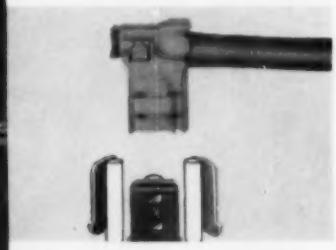
UNITED STATES DRILL HEAD CO.

BURNS STREET • CINCINNATI 4, OHIO

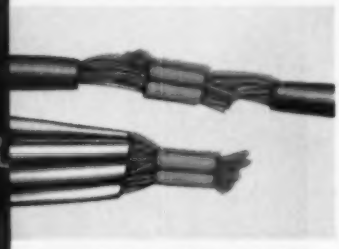




Pin receptacle made of Duraflex—hard temper, in strip form, at left, as fed into the automatic wire terminator. Finished form above.



Flag "Faston," a receptacle for .250" x .032" flat tabs, made of Duraflex—hard temper.



Connector for splicing coil windings to stranded lead wires in hermetically sealed refrigeration motors, made of Duraflex.

For solderless electrical connections that are sealed in

AMP Incorporated turned to DURAFLEX

Electrical connections inside a sealed refrigeration unit are not easy to service. So, for long, trouble-free operation, it is essential to use superior materials.

AMP Inc., Harrisburg, Penna., is one of the leaders in the development and manufacture of solderless wiring devices. For their connectors to be used in refrigeration service they turned to Duraflex, Anaconda's superfine-grain Phosphor Bronze with superior endurance limit.

The superfine-grain structure of Duraflex offers greatly improved fatigue resistance and formability . . . and a finer, harder, smoother surface. It provides the extra resilience and strength for constant and enduring contact pressure essential in this type of connection. It also offers high resistance to corrosion by the moisture-absorbing additive in refrigerant, plus, of course, good electrical conductivity.

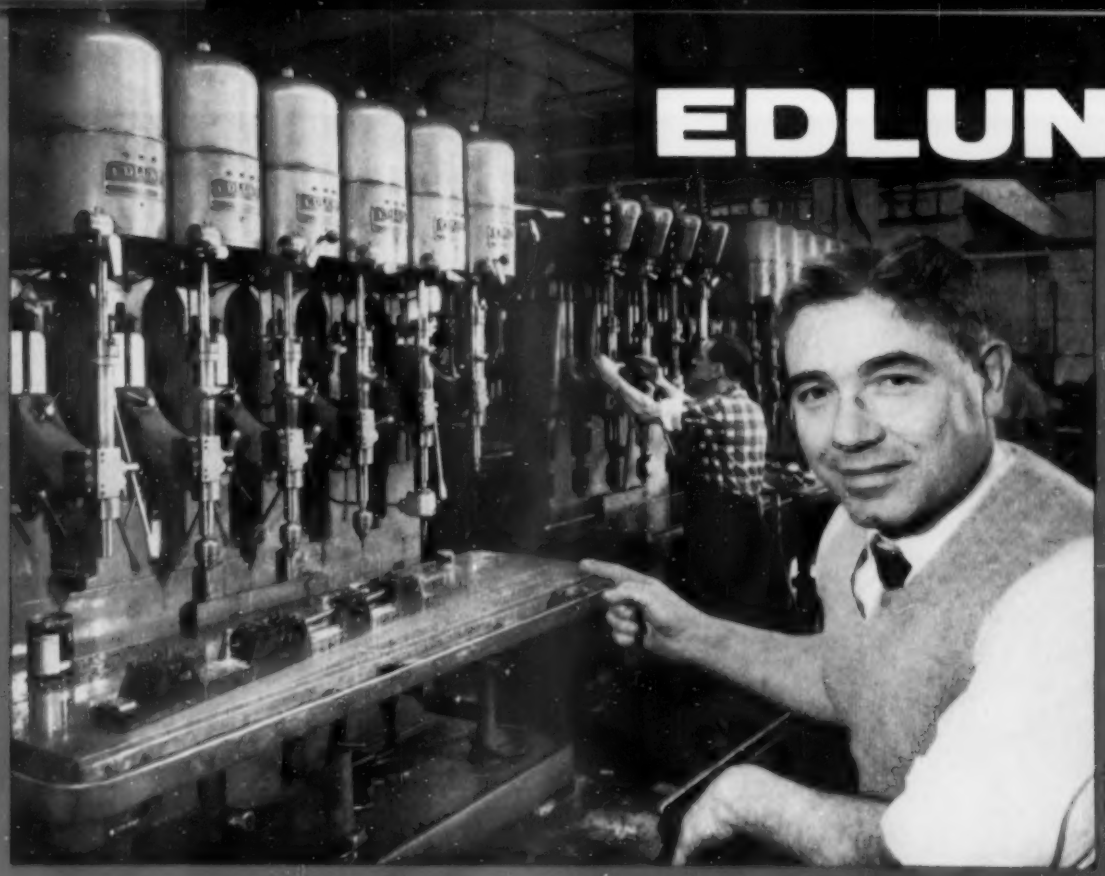
Duraflex is a premium product—yet it costs no more than ordinary phosphor bronze. Find out for yourself how Duraflex can help you cut costs, make a superior product. It is produced in sheet metal up to .062" thick and in wire up to 3/16" diameter. Write today for free samples you can test—specifying gage and temper. Address: The American Brass Company, Waterbury 20, Conn. In Canada: Anaconda American Brass Limited, New Toronto, Ontario.

5674

DURAFLEX

The New Superfine-Grain Phosphor Bronze with Greater Endurance Limit

An ANACONDA® Product



Some of the Edlund 2F Drilling Machines At Work on parts For Intertype's Famous Fotosetter

EDLUND

"EDLUND DRILLING MACHINES DO EVERYTHING WE WANT *With Maximum Dependability"*

At Intertype Corporation, Brooklyn, N. Y., outstanding manufacturers of typesetting equipment for printers, Edlund Model 2F Drilling and Tapping Machines received the following comments, according to an independent reporting agency:

"Down time due to maintenance has been eliminated with big savings in replacement costs"

"We have proved to our own satisfaction that the Edlund Drilling Machines require the least amount of maintenance"

"Constant delivery of horse-power for high precision work on toughest castings and machined parts"

"Greater flexibility of the Edlund Model 2F reduces trial and error in setting machine speeds because we can get correct in-between speeds"

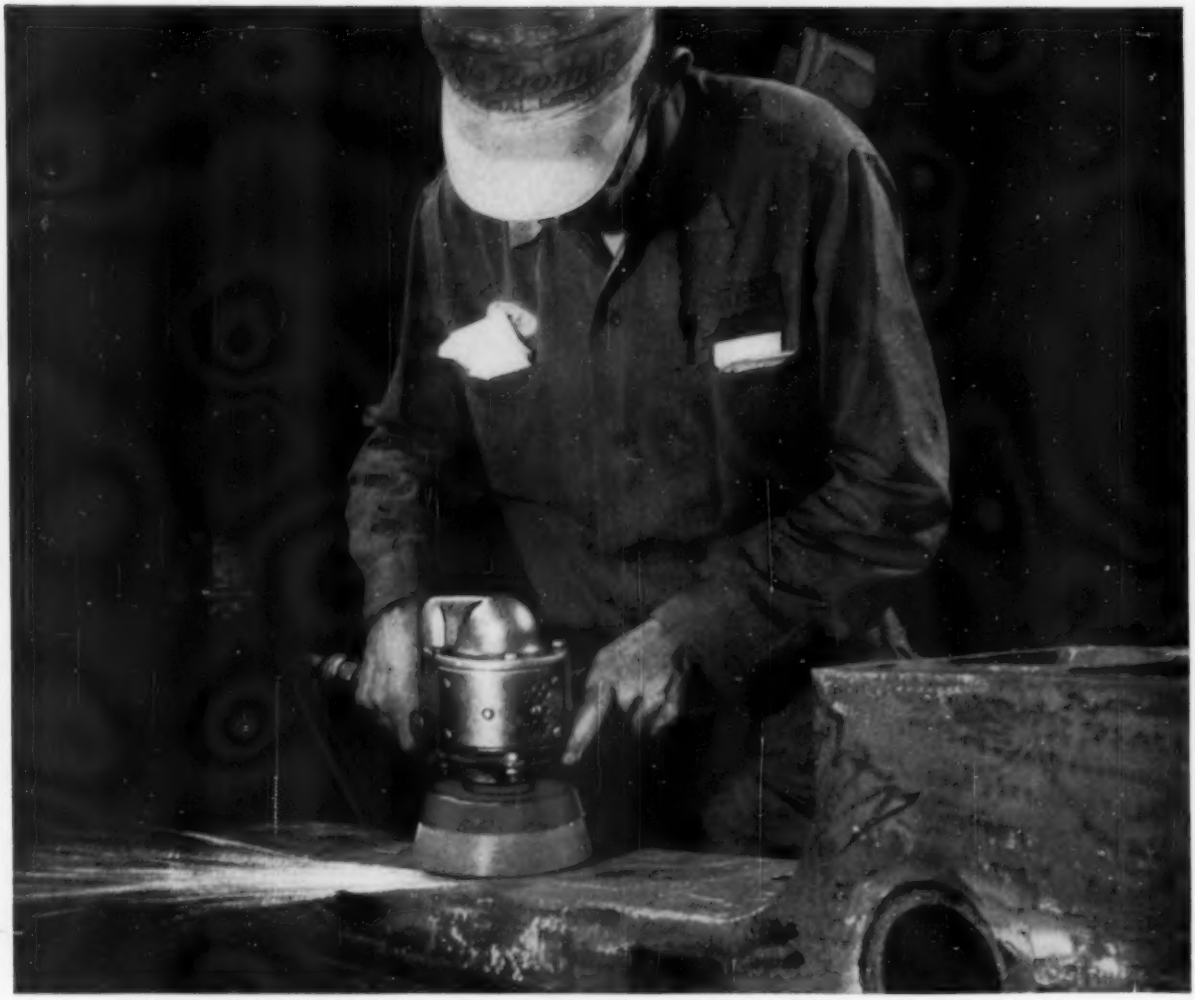
"7 additional Edlund 2F Machines were ordered last year and 6 more are on order now — these plus the 48 spindles already in operation best show our satisfaction"

Edlund Model 2F used for precision drilling operations at Intertype Corporation

EDLUND
MACHINERY COMPANY
Cortland, New York
Division of Harsco Corporation

For complete information and specifications about the Edlund Model 2F for your jobs write for Bulletin 140R.

Infinitely Variable Speeds to 2,600 rpm
8" - 12" - 15" Overhang
1¼" Capacity
Pedestal or Round Column types



Removes metal in ¼ the time

JOB: Cleaning machine tool castings, the Rotor B-35 Vertical Air Grinder paid for itself out of savings in this plant in 13.3 weeks. The former 3600 rpm electric grinder took 40 minutes to remove a pound of metal. **RESULT:** The 6000 rpm B-35 does it in 10 minutes—saving 75% in grinding time.

Your nearby Rotor Application Engineer will gladly demonstrate this or other new Rotor tools on *your* job. Ask for Bulletin 56. The ROTOR TOOL Company, Cleveland 32, Ohio.

ROTOR TOOLS
CLEVELAND, OHIO

Here's the RIGHT TOOL for YOUR job!

Rotor Air Tools: Assembly Tools • Drills • Small Wheel Grinders
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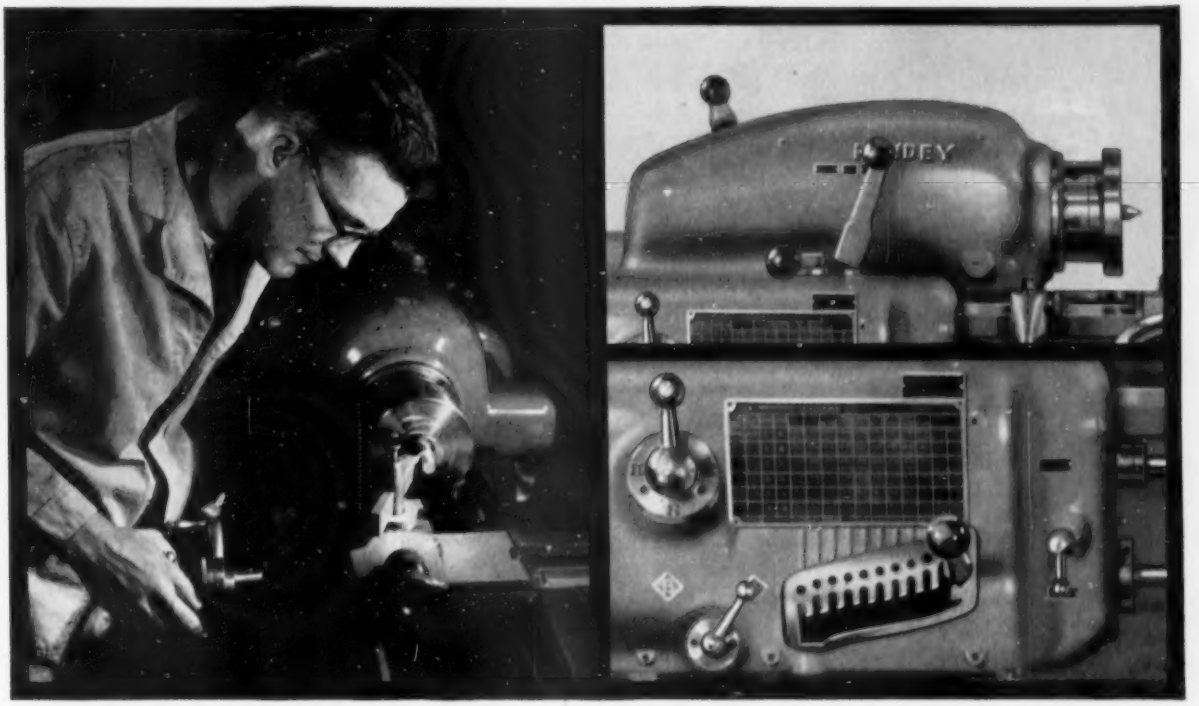
Rotor High-Cycle Electric Tools: Grinders • Polishers • Sanders

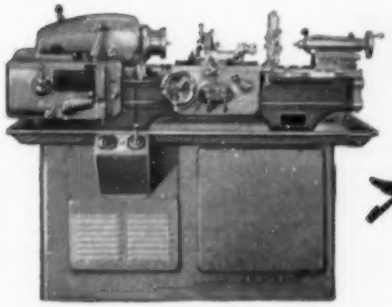
More features per dollar
than any other lathe
in its class!

Hendey 9" tool and gage-makers' lathe



High-speed, precision machining like the job above is backed up by Hendey features — like precision, antifriction bearings at both ends of spindle (upper right), and quick-change gearbox (lower right) for 66 changes of threads.

Infinitely adjustable spindle speeds from 15 to 3000 rpm — adequate speed for best results with carbide tools — both are yours with the magnetic amplifier drive on the Hendey 9 in. x 24 in. toolmakers' lathe. Geared feeds are from .002 in. to .120 in. per revolution of the spindle while belt-driven feeds range from .001 in. to .060 in. Every detail is designed for toolroom accuracy and long, trouble-free operation — yet the cost is below that of conventional machines. Ask your Hendey dealer about complete facts and features!



for precision with production, buy Hendey

Hendey **machine division**
BARBER-COLMAN COMPANY
53 Loomis St., Rockford, Illinois

BARBER COLMAN

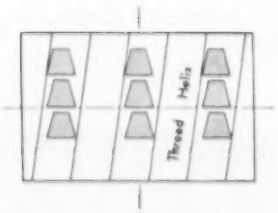
BARBER-COLMAN offers

thread milling requires accurate cutter design!

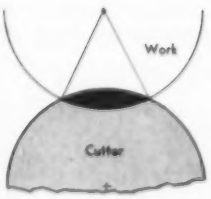
mathematical computation of cutter form

Multiple thread milling cutters often produce a thread space form which is not a duplicate of the cutter tooth form. The cutter tooth form is not a duplicate because the cutter tooth rotates in a plane which is perpendicular to the work axis and at an angle to the thread helix. This generating action produces a fillet at the bottom of the threads, and a thread space which is wider than the cutter tooth. When the amount of generating produces an unsatisfactory thread form, the cutter must be developed to produce the desired thread tooth thickness without fillet interference.

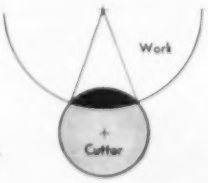
Whenever required, Barber-Colman engineers, by mathematical computation, design the correct cutter which compensates for the generating action. In this computation, the diameter of the cutter is very important since the amount of tooth form correction increases as the diameter of the cutter increases. A thread produced by a specially-developed cutter will have an accurate form which will fit the gage with the desired bearing.



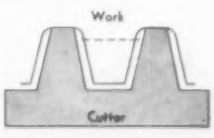
This schematic drawing shows how a multiple thread milling cutter produces a thread space which is wider than the cutter tooth. The cutter is set so that the plane of rotation of the cutter tooth is perpendicular to the work axis, and at an angle to the thread helix.



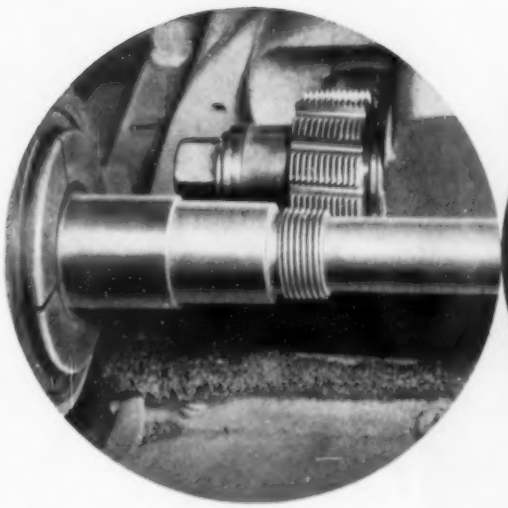
Large diameter cutters have greater length of contact and produce more pronounced fillets.

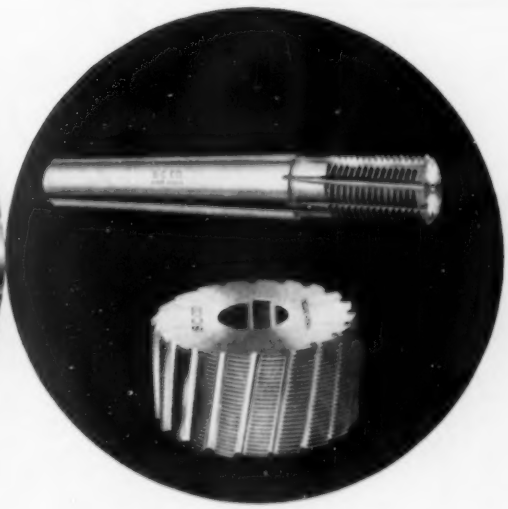


Small diameter cutters have less length of contact and produce smaller fillets.



In some cases, cutters mill deeper than true thread form. Any generated fillets which may be cut are then below the gaging surface of the thread. Correct cutter design takes care of this automatically.





original cutter accuracy in resharpening

All Barber-Colman form-relieved milling cutters are accurately index-sharpened on Barber-Colman automatic sharpening machines, so that all cutter teeth are the same height and accurately spaced. This makes it easy to maintain original cutter accuracy when resharpening either on automatic sharpeners, or on conventional sharpening equipment using the accurately indexed cutter teeth as a reference. In either case, accurate sharpening to original tolerances is easily maintained, and cutter sharpening time is reduced to a minimum.

design elements for maximum performance

With the proper tooth form developed to cut accurate threads, the engineers then analyze the job conditions to determine which cutter features will produce best cutter performance. These features include selection of the proper cutter material, shell or shank type cutters, straight or helical flutes, rake teeth, axial relief and intermittent teeth if sharp threads are desired. Since we make all classes of ground and unground thread milling cutters, we can recommend the cutter accuracy required for your job.

When you have a threading problem, consult Barber-Colman cutter engineers for their recommendations on the proper cutters for the job. Be sure the cutters you have are accurately designed to cut the correct thread form. Send us blueprints of your threaded parts for quotation on thread milling cutters designed to produce correct threads.

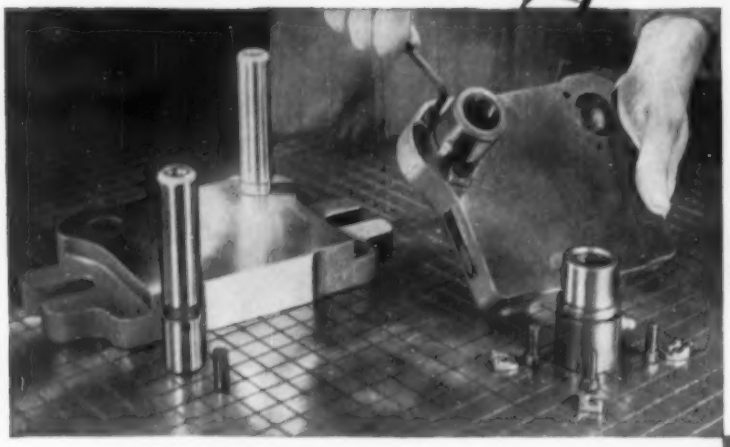
BARBER-COLMAN COMPANY

885 ROCK STREET • ROCKFORD, ILLINOIS

Hobs • Cutters • Reamers • Hobbing Machines • Hob Sharpening Machines

BARBER COLMAN

NEW quick change demountable bushings



ON NEW DANLY DIE SETS

Danly's demountable bushings, a new optional feature, are easily and quickly removed or installed . . . and an ideal companion for Danly's removable guide posts. Check these advantages: first, die maintenance work or grinding is hours faster when posts and bushings can be removed; second, several sets of interchangeable guide posts and bushings can be stocked for any die set to make die set inventory more flexible; third, because no pressing of posts or bushings is involved in assembly, the highest degree of precision is assured. A leading aircraft manufacturer reports that Danly Die Sets equipped with demountable bushings and removable guide posts permitted interchange of guide posts while holding closure accuracy within .0005".

These new demountable bushings provide exceptional resistance to wear, too, especially when used in combination with Danly MICROME chrome plated precision guide posts. No matter what your specific requirements are, you'll find that Danly Die Sets work best for you.

Leading industrial distributors and Danly branch assembly plants—located in all major tooling centers—stock Danly Die Sets for fast delivery.

DANLY

DANLY MACHINE SPECIALTIES, INC.
2100 South Laramie Avenue
Chicago 50, Illinois

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The Tool Engineer

On Our Way

We are now on our way in the second quarter-century of ASTE. The Society welcomes the responsibilities of the future in which the opportunities for progress know no limits. While our objectives and goals provide a constant challenge, we must remain sufficiently flexible to meet any emergency. The time from now until our golden anniversary should be a period of golden opportunity for the tool engineer.

With the number of tool engineers graduating from our universities ever on the increase, our American custom of disseminating knowledge will become more and more important. These men are our future and their technical knowledge must be augmented by experienced engineers' know-how. With cooperation between the new and the experienced engineer, all our manufacturing problems can be solved. Goals are easily achieved by those who work together, hand in hand, to accomplish their aims.

The advantages of our unselfish practice of revealing know-how become apparent when we compare our accomplishments with those of other countries. Even with outstanding manufacturing engineers, other countries never reach peak productivity because their ideas are guarded instead of exchanged. Our talent for productivity is fundamentally based on our willingness to share ideas.

The purpose of ASTE is to create the climate within which ideas—the very heart and soul of the tool engineer—may flourish to the benefit of our manufacturing economy.

In our profession, we must be alert and prepared so that our talents and ingenuity may be directed to any field of manufacturing. The astatic world conditions force us to be alert and prepared. Our security can be assured through progress which is made possible by intelligent application of tool engineering principles in industry.

H E Collins

PRESIDENT

QUALITY CONTROL REPORT

These sparks reveal vital facts about quality control of steel

You are naturally interested in the quality of your finished products—and if you use steel in making them, you should know about the Ryerson quality controls symbolized by this spark test.

Here a skilled Ryerson inspector is checking the carbon content of a steel bar by "reading" the sparks thrown off by an abrasive wheel. It's an amazingly accurate method of making sure that you get exactly the steel you order.

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how to apply special machine tools

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Although special machines may cost more than standard machines, they are highly effective when properly utilized. Considerations for their use are discussed in this article.

ENGINEERS in the manufacturing field frequently raise the question of how to recognize opportunities for the application of special machines. While such uncertainty is understandable, actually the subject is less complex than many imagine. In fact, there are certain general principles which may be used as guides. Before looking at these, however, it might be well to define exactly what is meant by special machine tools.

The term is often used rather loosely and forms entirely different pictures in the minds of different people. Basically, a special machine tool is a work method rather than a mechanism. The process of designing such a tool begins with an examination of the work to be done. When production needs are thoroughly understood, designers begin putting their ideas on paper. The actual building of the machine comes last in the process.

It may bear some similarity to machines that have been built previously or it may be unique. At any rate it is a machine essentially free of compromises and is designed for maximum effectiveness on a specific part or a specific class of work. It need not be strictly a single-purpose tool. Actually, it can have more versatility than a standard machine, if this factor is properly appraised at the start.

Both standard and special machines are bought for the same general reasons. Any of the following five prime objectives may influence management to invest in new machine tools:

1. To expand production
2. To reduce manufacturing costs
3. To accommodate product design changes
4. To improve product quality
5. To replace worn-out equipment.

Of course, these all add up to one basic objective: more profit. Intelligent investment of capital in special machine tools can increase production while reducing costs. Some of the specific situations

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Abstracted from Paper 15, "Special Machine Tools for the Oil Country," presented at the 25th ASTE Annual Meeting. Copies of the complete paper are available for purchase from Society Headquarters.

where it is desirable to investigate their possibilities will be described.

Generally, it is advisable to consider a special machine tool when a firm is planning to expand production and when the obvious method would be simply to multiply present facilities. Frequently, through combined operations, special tools and processes and perhaps some automatic handling, one special machine will produce as much as several of conventional type. The special usually, not always, requires a larger initial capital outlay; however, the return on investment can be excellent.

As an example, a builder of small engines was considering the purchase of four conventional machines for various operations on cylinder blocks and heads made in relatively small quantities. Instead, he bought a special machine, fixtured to do all of the milling operations on blocks and heads. The cost of this special mill was about half of that of the four conventional machines. Furthermore, only one operator was needed instead of four and only about one-third the floor space was required.

In another instance a manufacturer of mud pumps for oil rigs wanted to increase production and reduce the cost of boring connecting rods, previously done on a general-purpose machine. He had a wide range of spacing and hole sizes. Yet only a few pieces of the same size were made at one time. By boring both holes at once and with special boring tools, all of his volume could be handled on one machine with time left over.

The machine was designed to change rapidly from one size to the other, *Fig.* 1. The only problem was that its cost could not be justified on connecting rods alone. By a slight modification of design, with proper tooling, this special machine was arranged to bore compressor cylinders also and in much less time than was required on conventional machinery. This machine now operates around the clock on small lots of connecting rods and cylinders, which at first seemed incompatible.

To reduce the cost of manufacture, two approaches are possible. The direct way is to work on the cost of machining. An indirect method is to machine more accurately, so as to reduce the amount of fitting or assembly time required.

One of the most obvious fields for cost reduction in manufacturing is the item of direct labor, whether it is in machining or assembly. If a product requires a large number of operators on a given operation or related group of operations, it would be advisable to investigate applicability of a special machine tool.

Investing in a special machine tool in this case becomes an investment in prepaid labor of a desirable type. It enables good men, of whom there is always a scarcity, to produce more goods at lower cost.

In justifying the purchase of machine tools, some concerns will consider direct labor savings only. This is unrealistic. When a man is hired, the employer not only obligates himself to pay the wages, but also to cover many other costs, which fluctuate with actual wage outlays.

Admittedly it is difficult to determine these other factors. As a rule of thumb, saving a dollar of direct labor generally saves another dollar indirectly. While these extra savings may be half this much or twice that figure, the point is when more production and skill are built into a machine tool, thus extending the usefulness of the labor force, most certainly the saving is more than wages alone.

A less obvious but potential area for cost reduction is the use of special machine tools that will permit the employment of processes not available on

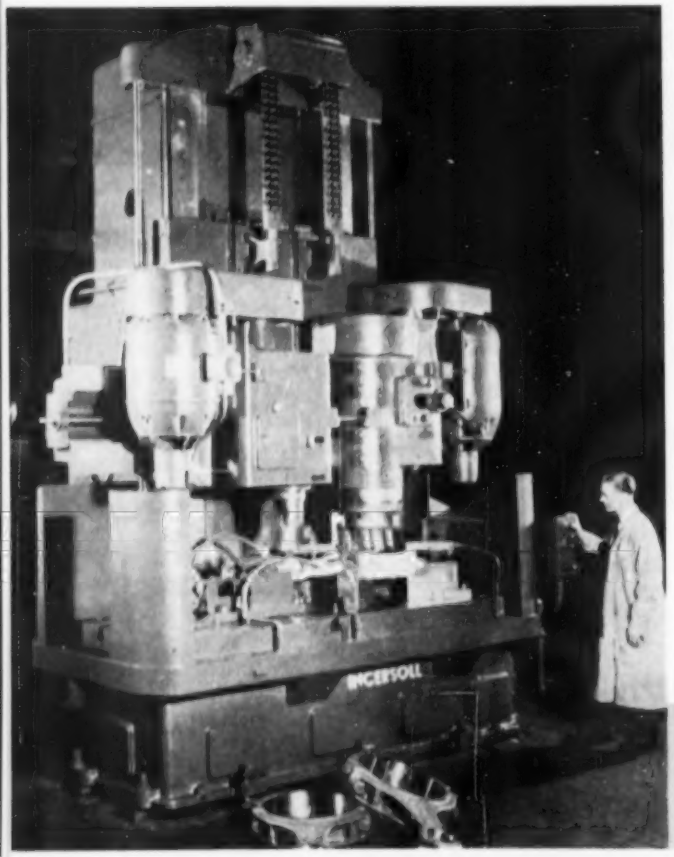

Fig. 1. Two-spindle vertical boring machine for large connecting rods and compressor cylinders.

conventional equipment. When it is necessary to consider new machinery in order to accommodate design changes, one should take a look at the possibilities of special machine tools. The oil field equipment industry, for example, has some specialized manufacturing problems.

They perform heavy but precise operations on a wide variety of materials, mostly tough to machine. Their products are made in small lots with many variables and must be available for immediate delivery from a minimum inventory. Their customers want top quality but competition is keen and cost is important. Many such firms are growing rapidly and are limited for capital.

These factors, instead of ruling out special machines, are conditions that make them especially desirable. Precise operations on tough materials frequently call for grossly overloading a conventional machine. If small lots with many variables are common, a special machine can be designed and tooled effectively for unusually fast setup changes and with the variables included in tooling. This makes for fast production and turnover with minimum inventory. Cost reduction with specialized equipment is axiomatic. If a firm is growing rapidly and has a limited capital, a special machine with a high rate of return is one way of meeting the situation.

A need for improvement in product quality may also indicate the desirability of a special machine. The special machine can combine multiple operations in a single setup, preserving a more accurate relation to other surfaces than if successive settings are made. An unusual degree of rigidity can be provided where this is a requirement. Special tooling can be developed when finish or geometry is a problem.

Five reasons have been given for the purchase of new machine tools. The fifth reason, replacement of worn-out equipment, has more possibilities than is at first apparent. This situation presents an excellent opportunity to review not only the specific operation that is under consideration, but related operations as well. Often, by the time a machine is worn out, better methods will be available and the opportunity for profitable investment in a special machine tool is ripe. The technique is to look beyond the worn-out tool.

A good example of the effectiveness of this approach can be found at Ingersoll, where one piece of a kind is the rule. Thirty years ago, when such a plan was begun, the firm had 265 machine tools. Now there are only 192. These average 5½ years of age. Production has multiplied with fewer but more effective tools and expansion of the total plant area has been proportionately much less than the increase in shipments.

A frequent question is whether enough versatility

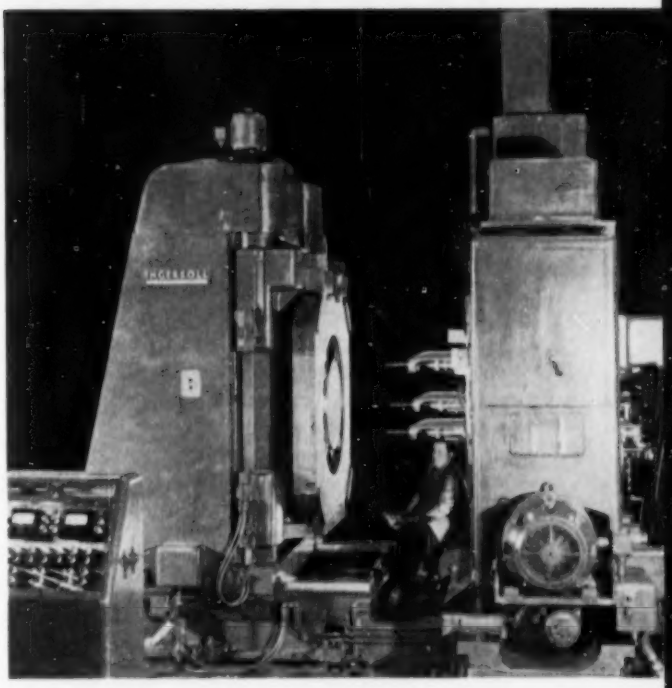

Fig. 2. Drilling machine for producing heat exchanger tube sheets. Setup for different hole patterns is simple and rapid.

can be engineered into a special machine to make it profitable on small lots with widely varying geometry. Some examples of special machines may be enlightening in that respect.

A manufacturer of heat exchangers had to be prepared to furnish any of about 5000 combinations of hole patterns in many sizes of tube sheets. He formerly drew them up, laid out a metal template, drilled the template, used this to spot drill the tube sheet blank, then drilled the tube holes—all of this at the rate of one hole at a time. It is not uncommon for a tube sheet to have 500 holes.

The machine he is now using is shown in *Fig.* 2. Multiple spindles are adjustable to different positions and are set to drill or not to drill by a simple template that can be quickly cut from a blueprint of the layout. Spacing is accurate and is changed as simply as shifting gears. Drilling several holes at a time, the machine progresses along each row, and from row to row, automatically. The steps of laying out and drilling the template and spot drilling the blanks are eliminated. The operator has ample time to position the next pair of blanks into a holding device while the previous set is being drilled.

Once the difficult phase of defining the problem was accomplished, it was no problem to accommodate 5000 patterns, two pieces in a setup. In fact, it was possible to provide means to accommodate an occasional part even larger than the fixture. This is a versatile special machine tool.

Engineers who design rock bits specify many combinations of compound angles, varying pitches, interferences, blind cuts, tough materials and conditions that require inherently inefficient cutters. Added to that are the problems of small lots, a highly competitive field, and impatient customers. Those are some of the factors behind the machine shown in *Fig.* 3.

This machine has embodied all five of the reasons giving for buying new machine tools. It meets the need for expanded production while effecting a reduction in manufacturing cost. It accommodates new designs of product that could not be made on earlier machines. It improves product quality and replaces worn-out tools. A point made previously, that of using processes not available on conventional equipment, is also illustrated. Through special design, it is possible to run existing tools at about 25 percent faster feed with no sacrifice in tool life. While this machine looks complicated, it can actually be set up in less time than smaller, simpler machines doing the same work because fast setup was properly recognized as a basic factor in the problem.

Of the various factors that combine to make an effective special machine tool application, there are three which need further attention. The first occurs at the beginning of a study, and calls for thoroughly and carefully defining the problem, so that the designer can develop a tool with the necessary degree of productivity, accuracy, versatility and range of product.

The second follows immediately and consists simply of transmitting intimate and detailed experience of the operation to the project engineer, so that he can combine the producer's specific knowledge of the particular problem with broad general experience, developing a machine based on wide experience and yet focused clearly on the specific job.

The third and final phase is extremely important, and too often is overlooked. By the time the machine goes into operation, some means should be established for checking its performance. It is not unusual to get a 25 percent annual return on the investment in a special machine tool. If the return drops substantially below expectations, however, immediate action should be taken.

From the first, facilities should be set up to advise management continuously and accurately on how machine performance compares with prediction. Thus necessary steps can be taken to correct any condition that may cause it to lag. Furthermore, a documented record of performance is the best means for getting another appropriation when a new machine is needed.

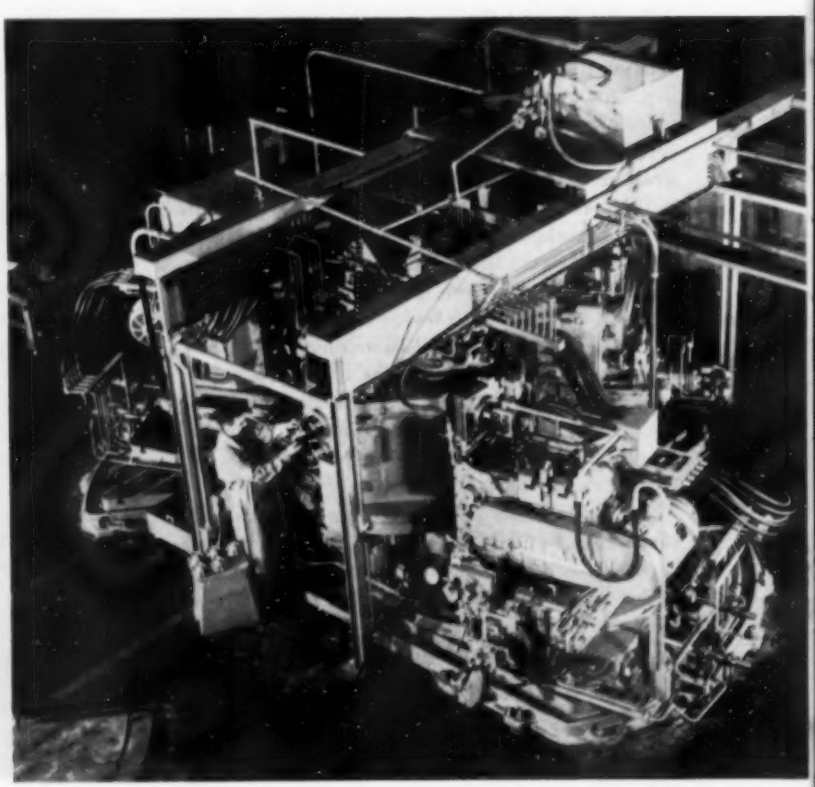

Fig. 3. Rock bit milling machine for new designs that could not be manufactured previously on available equipment.

Gadgets

Ingenious Devices And Ideas To Help The Tool Engineer In His Daily Work

Coolant Unit

Maintenance of conventional small coolant units, consisting of a tank and a motor-driven pump, is sometimes a problem. Recently when it was necessary to replace such units in a toolroom, air-powered units of the type shown in Sketch 1 were designed and built. These units have given virtually troublefree service.

The units are powered by the shop compressed air supply. An airtight tank, containing coolant, is equipped with inlet and outlet lines. At the end of the outlet line is a flexible nozzle of the type commonly used for applying coolant. Air entering the inlet line passes through a pressure regulator valve and a two-position valve. In one position of the valve, air is admitted to the tank, forcing coolant on the work. Coolant is collected in a chip pan under the work. When the pan is full, the valve is turned to the alternate position, allowing coolant to drain back into the tank.

A filter prevents chips from draining back into the coolant tank when the chip pan is drained. If any chips pass through the filter into the return coolant line, they are forced out by air from the tank. This action occurs automatically each time the valve is opened to allow coolant to drain.

The amount of air required to operate the unit is small. The pressure regulator valve is set within the normal shop range of five to fifteen psi. A pressure of only five psi is sufficient to lift coolant a distance of eleven feet in the discharge pipe.

A safety valve, Sketch 2, should be provided as a precaution against excessive air pressure building up in the tank. This valve can be installed as part of the cover plate. While the air-powered coolant unit is not suitable for use with heavy production machinery, it does an excellent job for toolroom applications where heavy coolant flows are not required.

Ernest Jones
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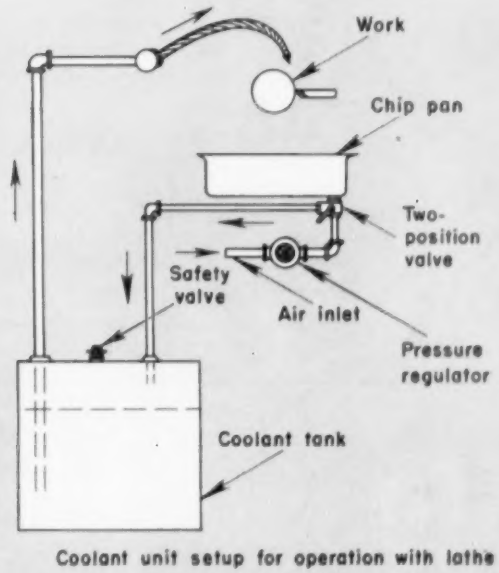
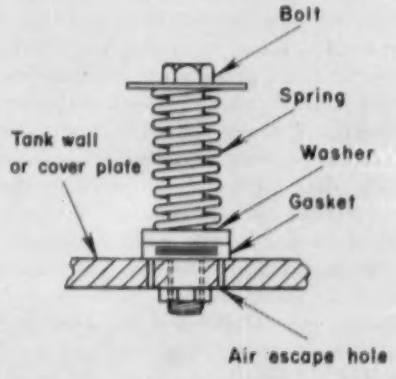
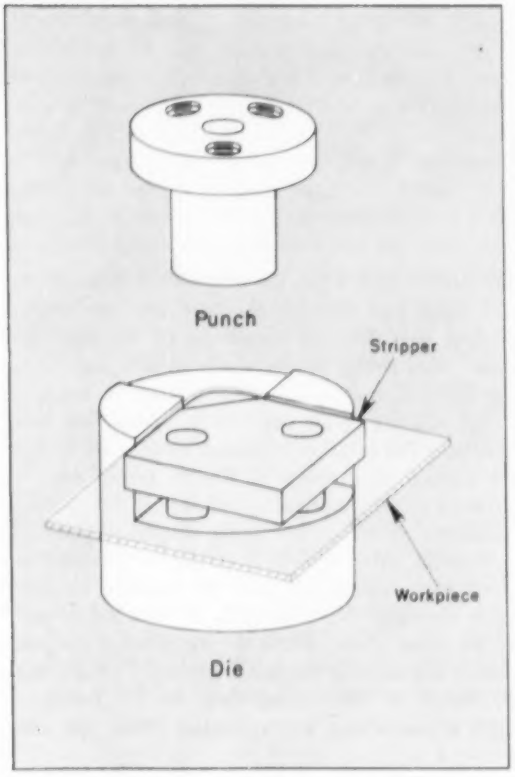


Coolant unit setup for operation with lathe
Sketch 1



Safety valve
Sketch 2



Corner-Trimming Die

Shops that do sheet metal work will find that a corner-trimming die such as illustrated can often be used to advantage. This die is relatively simple to make because it employs a round punch and a round die opening. The die is made from round stock, with a die opening bored to fit the punch. Design of the punch is evident from the illustration. It is secured to the punch holder by screws and dowels.

A 90-degree area at the rear of the die is milled to a depth of one-eighth inch to accommodate the corner of the workpiece. At the front of the die, a deep recessed area is milled out, also covering 90 degrees. This area accommodates a spring-loaded stripper, which is mounted so that its top surface is flush with or slightly higher than the recessed area at the rear of the die.

In operation, the square corner of the stock to be trimmed is placed on the stripper and butted against the walls of the milled-out front section. When the punch descends, the square corner is cut off. Trimmings can be pushed off when the next piece of stock is placed in the die, or the press can be inclined so trimmings fall off the die.

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Rockaway Beach, New York

Punch Aligning Tool

Alignment of punches and dies used for piercing holes in bar stock was a time-consuming operation until the aligning tool illustrated was developed and put into use. As is common practice for this type of punch-press work, the punches and dies are mounted on open shoes without guide pins. The bar stock is heavy and consequently there is a considerable amount of clearance between the punch and die. To center the punch in the die opening, formerly it was necessary to check the gap with shims and tap the die into position.

With the aligning tool, the punch is clamped in the ram of the press and the tool is dropped into the die as shown. The punch is then brought down into the cavity in the aligning tool and the die is aligned and locked into place on the press bed. The tool can be tied to the die when not in use.

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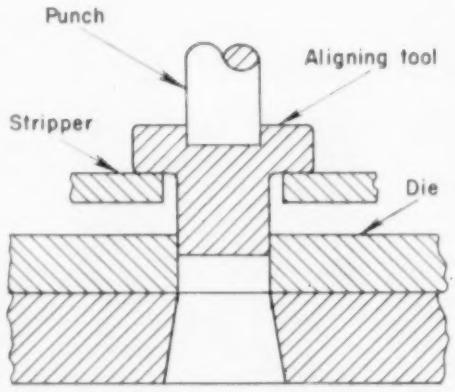


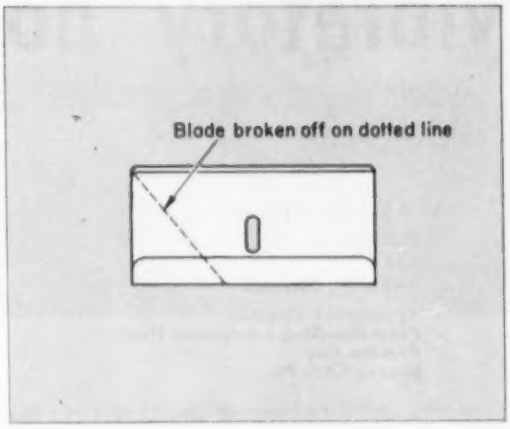
Gadgets

Making Rubber Ring Gaskets

Ring type rubber gaskets are usually die cut. However, when only a few gaskets are required, the cost of building a suitable die is prohibitive. A good solution to this problem is to cut the gaskets on a lathe.

A safety razor blade is broken to the shape shown on the drawing and clamped to the side of a lathe tool. A sheet of rubber is stapled to a piece of wood which is in turn mounted on the face plate of a lathe. By setting the point of the razor blade to plunge into the rubber sheet, first on the ID and then on the OD of the gasket, perfectly circular cuts can be made without tearing the rubber.

H. E. Meloling
Syracuse, N. Y.

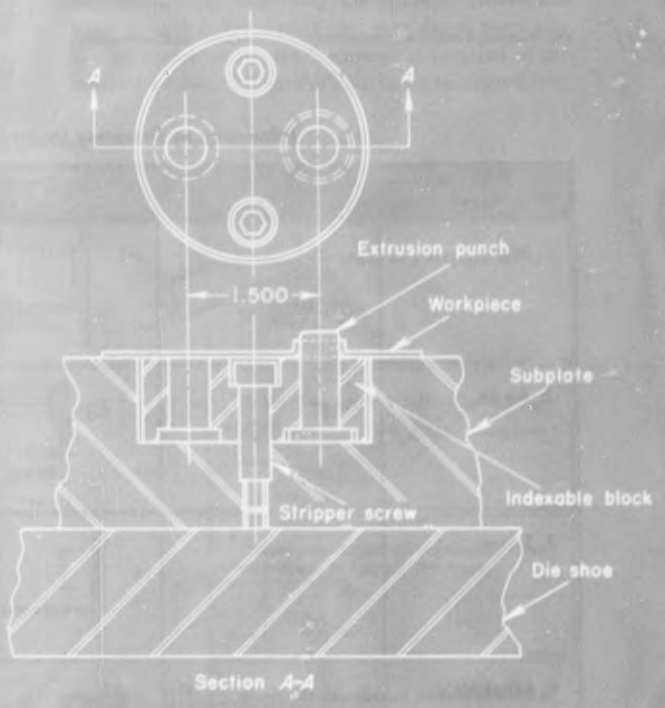


Dual-Purpose Die

Occasionally it is possible to design a die so it is adaptable to production of several similar parts. This eliminates the need for die changes and minimizes down time.

The die illustrated, which is used to produce different size extruded holes in two otherwise identical sheet metal parts, has a special punch holder which can accommodate either of two punches. When the production run on one part is finished, the punch holder is removed, one punch is taken out and the other punch is inserted. The punch holder is then mounted so that the new punch is in the correct radial position for operation. Because this change-over can be accomplished quickly, press equipment is more efficiently utilized.

F. A. Adams
Dayton, Ohio



application of

vibratory hopper feeders

By Woerner McKinsey, Jr.
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Hopper feeding of parts is an important aspect of automation systems. In addition, there are many other possible uses of hopper feeders in production. Principles of operation and application of the vibratory type of feeder are discussed in this article.

VIBRATORY HOPPER FEEDERS have many advantages when used for feeding small parts to machines or assembly operations, *Fig.* 1. They provide a reliable means of orienting parts into the correct position for the production operation, *Fig.* 2, and are capable of handling a wide range of parts and materials. Workpieces of wood, metal, plastic, rubber, glass and paper, as well as ceramic parts, explosives and even bulk material can be conveyed, regardless of fragile nature. Almost any imaginable shape, including ball bearings, can be fed.

An important question is what size of parts can be handled. With this system, the smallest part

Tabulation of Orienting Devices Used in Parts Feeders

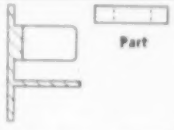
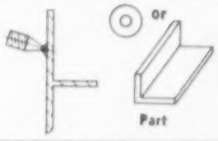
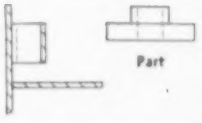
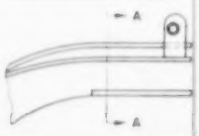
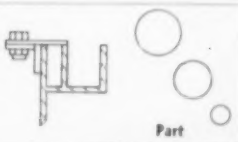
Orienting Device	Plan View	Cross-Section A-A	Function of Device
1. Wiper			Wipes off excess parts and those perpendicular to the spiral track.
2. Air jet			Blows off top layers of washer parts; orients angle parts by blowing those in wrong attitude off the track.
3. Spacer			Wipes off all parts except those whose major diameter is down.
4. Adjustable spacer			Provides a variable track width to handle a range of sizes of parts of the same type.

Fig. 1. Setup for automatic feeding of parts for a complex assembly at Burroughs Corp. Nine vibratory feeders are used to orient the parts and start them down the track. Ten of each of the different parts are combined in the assembly in a matter of two minutes.

known to have been fed was a one-millimeter ball such as used in ball-point pens. The largest known part fed was an 11-inch forging blank and a 36-inch diameter bowl was used.

The basic characteristics of the hopper give it an unusual uphill feed, *Fig.* 3. Elements of the feeder are shown in *Fig.* 4. They consist of a bowl of cast aluminum, fabricated carbon steel or stainless, an electromagnetically operated driving unit. The bowl mounting plate is attached to the armature of the electromagnet. Directly under and opposing the armature is the coil and core assembly. This is positioned above a large, heavy base casting, which is rubber mounted to isolate vibration.

To explain the principle of conveying parts uphill on the spiral track, one should imagine a single piece-part initially occupying a spot on the track as the coil is energized. When the coil is energized, the armature, bowl mounting plate and bowl are sharply pulled down and away from the part. Because of the angular leaf-spring arrangement, a slight radial twist is imposed on the downward movement, thus distorting the springs. When the bowl is pulled downward, the part drops vertically to a new spot on the track somewhat forward of the initial position. When the coil is de-energized, the

Tabulation of Orienting Devices Used in Parts Feeders

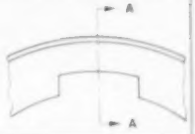
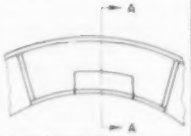
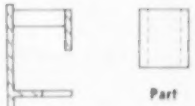
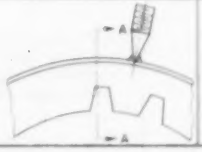
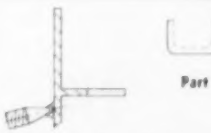
Orienting Device	Plan View	Cross-Section A-A	Function of Device
5. Cutout			Produces the effect of a narrower track.
6. Hood and cutout combination			Orients in a vertical position cylindrical parts with $\frac{L}{D}$ ratio is greater than one.
7. Notched track			Causes cup-shaped parts traveling open side down to fall off the track.
8. Notched track and air jet combination			Blows off cup-shaped parts which tend to be carried across a notched section by the feed pressure.

Fig. 2. Close-up of one of the feed arrangements of the burroughs setup shows orienting device and provision for return of excess parts to the hopper.

springs return the bowl to its original position further advancing the part.

At high frequency this movement of approximately 0.030 in. cannot be seen. Instead it appears that the parts are flowing like a fluid. This type of movement develops exceptionally low abrasive action between the parts and track surface since parts are momentarily suspended while the track drops away from them and then picks them up, moving them forward preparatory to the next cycle.

The coil and core assembly can be adjusted vertically to vary the air-gap setting. Mounted on the underside of the base casting are rubber vibration dampeners to isolate the vibration and contain it within the vibratory unit to keep it from escaping to the supporting sub-structure. The armature casting and base casting are joined flexibly by a system of leaf springs.

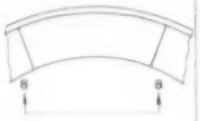
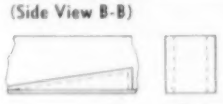
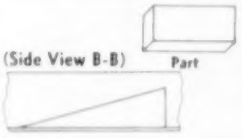
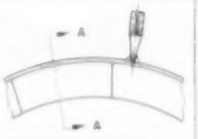
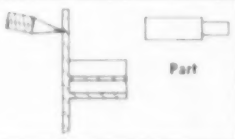
A properly designed system incorporates the correct number of springs of the proper thickness to assure a tuned system. This should be three to five cycles higher than the frequency of the supply current. For instance, a 60-cycle feeder should have a period of 63 to 65 cycles. Such a period range is selected to secure stability.

In a typical feeder, the a-c current to actuate the feeder is initially passed through a half-wave selenium rectifier housed in the base unit covers, or in a separate control box with operating switch and rheostat. Function of the half-wave rectifier is to allow the a-c wave to flow in one direction only. Thus, the coil of the electromagnet is energized once per cycle, developing a vibration frequency of 3600 vpm on 60 cycle-current. The unit can be arranged to operate on 50 cycle rectified current having a vibrating frequency of 3000 vpm, or it can operate on straight nonrectified 25-cycle current also at 3000 vpm. The amplitude is variable and adjustable through rheostat control, while the frequency of the unit is fixed and constant, being dependent upon the frequency of the input current.

The electromagnet can be enclosed in a flexible shroud or dust-tight cover for handling explosive components or dusty materials. Similarly, the controller parts can be housed in a separate dust-tight or explosion-proof enclosure.

While linear feeds of 50 to 60 feet per minute

Tabulation of Orienting Devices Used in Parts Feeders

Orienting Device	Plan View	Cross-Section A-A	Function of Device
9. Full step riser			Causes cylindrical parts traveling in a longitudinal attitude to stand on end.
10. Track edge riser			Transposes parts traveling across the track 90 deg. so their long axes are aligned with the track.
11. Riser and air jet combination			Orients parts with varying diameters or end weights into a "heavy-end leading" attitude.
12. Sloped track			Feeds a single layer of washer type parts or feeds parts with a radius or chamfered edge with their sharp cornered edge down.

have been attained using a lightweight fiberglass bowl, this is scarcely a practical feed rate. In handling most small parts a feed of 10 to 15 feet per minute is normal.

The important problem is how feed rate in feet per minute can be correlated with the rate in pieces per minute. Feed rate in terms of pieces per minute depends on size, shape, weight, center of gravity and other characteristics of the workpiece.

Assuming a cylinder one inch in diameter by two inches in length, this part can take any one of several different positions as it travels along the track. For instance, it could stand on either end, lie longitudinally or roll with the long axis perpendicular to direction of feed.

If the application calls for orderly discharge of only those parts in a longitudinal position, then all others must be rejected. To determine the feed rate it is necessary to add the combination of dimensions represented by these different positions. Thus, for the example the three positions would represent one two-inch length and two one-inch diameters. To discharge one part in proper position, that is to realize two inches of net feed, it is necessary to provide a feed of four inches of parts, so to speak. With a linear feed rate of 144 ipm the discharge rate of parts would be approximately 36 pieces per minute.

Nearly all parts have a certain position that they tend to assume because of shape, center of gravity or other characteristics. For example, most cylindrical parts would tend to convey with the long axis horizontal—that is, either longitudinal or rolling. This is important for establishing a system of odds, which are different for every type of part and have a direct bearing on the net discharge rate.

The best way to determine the "odds factor" is to drop several handfuls of parts on a table and count how many pieces assume each position. This gives the approximate odds in favor of each position.

If the center of gravity is selected as the characteristic to use on a particular part, the desired position might require an abnormally high rejection rate. It would then be wise to try to orient the part in a different position which would favor the rate situation.

By utilizing one or more of the various orienting devices shown in the accompanying tabulation, ordinarily desired orientation can be secured. Usually a part can be turned 90 tor 180 degrees, laid down, stood up or flipped around as required. With these devices this can usually be accomplished within the bowl by selecting the proper features needed for the part and incorporating them into the track and bowl wall.

If this is impractical, orientation must be accomplished outside the bowl, in the mechanical handling system. For instance, if the length-to-diameter ratio of a stud-like part is slightly greater than one, this part usually would be discharged from the feeder by dropping down through a hole with the long axis vertical as in orienting device number 22. The part can then be mechanically handled into almost any other attitude desired.

If the parts had to lie side by side with flat ends on a line, long axes parallel to each other, this

Tabulation of Orienting Devices Used in Parts Feeders

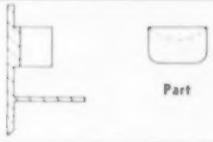
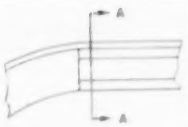
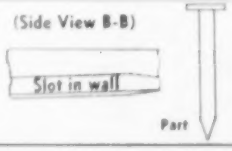
Orienting Device	Plan View	Cross-Section A-A	Function of Device
13. Center of gravity wiper			For parts with a chamfered or rounded end, whose $\frac{L}{D}$ ratio is less than 1. Only parts with sharp edges toward the bowl wall will pass under the wiper.
14. Dual rail discharge			For parts whose $\frac{L}{D}$ ratio is much less than 1 transports parts by collar between two rails. Parts with collars down pass under and drop back into the bowl.
15. Dual rail discharge section			Provides a hanging position for bolts, etc.
16. Slotted wall and dual track combination			Feed for long-headed parts, which first hang through the bowl wall and are then turned into a vertical position.

Fig. 3. Small tubular type part is fed to grinder. Parts are fed at regularly spaced intervals.

could be accomplished by first flowing the parts by gravity in a vertical tube from the feeder. The tube could then be bent back to the horizontal at the discharge end where a horizontally acting shuttle could remove the parts in a rolling attitude 90 degrees to the original direction of flow.

This is an extreme case. The orienting features shown indicate a solution to a variety of more common problems. It can be seen that several of these devices are generally required in one bowl to obtain the exact orientation desired for any given part.

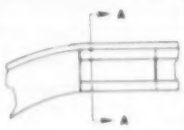
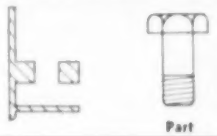
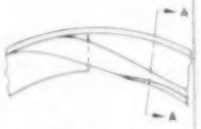
Lightweight parts convey at an inherently lower rate than heavy parts. In the case of a solid steel cylinder, a linear rate of 12 or even 15 fpm could be used. With hollow cardboard or lightweight plastic tubes, the feed rate should be five to six fpm. Coating the bowl interior with Neoprene may improve the feed rate.

Bowl Design: There are no well-established limits for bowl sizes. The smallest standard bowl is 5 inches and the largest is 36 inches in diameter. There is no reason however why larger bowls cannot be built, as well as smaller.

Another decision is which type of bowl to use: cast aluminum or fabricated steel. While there is a definite place for each, where abrasive wear is a factor, the fabricated bowl is generally preferred. Also, more difficult orientation techniques can be worked out with a fabricated bowl. Recently developed glass fiber reinforced plastic bowls are also good for abrasive applications. This type bowl affords an opportunity for reduction in weight. It also gives considerable reduction in moment of inertia, allowing larger bowls to be used with a given drive unit.

In the design of the bowl, when production rate requirements at the part processing point is greater than the output of the feeder, most bowls can be provided with multiple tracks. With two tracks arranged to discharge adjacent to one another or above one another it is possible to double the

Tabulation of Orienting Devices Used in Parts Feeders

Orienting Device	Plan View	Cross-Section A-A	Function of Device
17. Tripping mechanism			Trips hanging parts at the end of dual rail discharge to produce a head-first attitude in the external gravity feed chute.
18. Twisted single rail system			Zipper body will ride on this rail only with the projection up. Parts are then turned to vertical position.
19. Single rail on track			Orients parts so slotted end is down and slots in line.
20. Sloped single rail			Feeds tab-like parts only with the projection up and pointing toward center of the bowl.

effective feed rate. The parts flowing from the two tracks are joined by a mechanical converging device. Discharged sections of multiple track bowls can be arranged 180 degrees apart for two tracks, 120 degrees apart for three tracks, etc., to allow one feeder to supply two or more work stations simultaneously.

Another problem often encountered is that of oil-coated parts. These can often be handled in a vibratory feeder by a modification of bowl design. In a flat, oily part, surface tension is such that it must be overcome before the part can be conveyed. Usually oil drain provisions such as use of perforated track sections, and other features of this nature will accomplish satisfactory feeding.

In bowl design there is another consideration which cannot be overlooked, commonly referred to as "back pressure." Since the discharge rate from the feeder cannot be made to exactly match rate requirements of a process, provision must be made to level out the discharge rate. This is usually accomplished by overfeeding the parts in order to assure adequate and positive supply at the work station. This excess feed, secured by stepping up the feed rate, creates the problem of disposing of surplus parts. With the parts handling system full of oriented parts, including the gravity feed chute, feed pressure against such a "dead-end" system creates buckling and jamming within the feed bowl. With most parts it is possible to design the bowl so that the excess of parts will be automatically fed back into the bowl, allowing the feeder to run continuously. Such a bowl is said to be built for "back pressure."

If the part characteristics are such that the bowl cannot be built to eliminate back pressure, it is necessary to operate the feeder intermittently. In

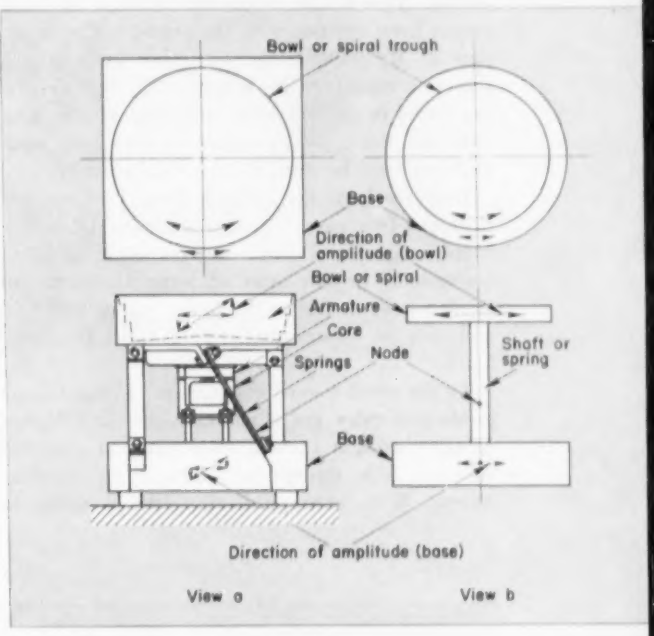
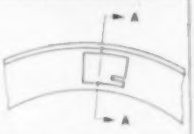
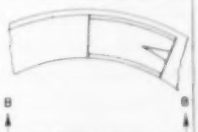
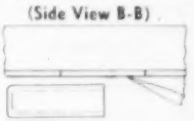
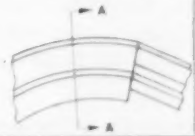


Fig. 4. Sketch of vibratory feeder showing major elements, view *a*. Simplified diagram in view *b* indicates principle of operation.

Tabulation of Orienting Devices Used in Parts Feeders

Orienting Device	Plan View	Cross-Section A-A	Function of Device
21. Silhouette			Parts drop through a slot only if positioned a particular way. This setup requires a considerably lower speed than other methods.
22. Through-hole discharge			Cylindrical or slug type parts, whose $\frac{L}{D}$ ratio is approximately 1, drop through the hole with axes vertical, regardless of approach attitude.
23. Pin technique			Tubular parts with the closed end leading drop through opening in track. Part feeding with open end first catches on pin and drops same way. Usually not 100 percent accurate.
24. Trough type rail section			Feeds headed parts from wide track into trough section where the parts line up head to head and proceed on to a conventional set of rails.

such cases the gravity chute is used as a "bank" for parts and the feeder is operated only as needed to keep up with the machine rate.

Intermittent feeding can be accomplished by incorporating limit switches in the gravity chute. If part size or weight precludes use of limit switches, photocells, proximity pickups, electrified chute sections or other means may be employed.

If a lower and upper limit switch are used, then a time-delay relay would be required for the upper switch. This would be needed to keep the upper switch from opening with the passage of each part past it. By introducing two upper limit switches the same result can be secured. The two switches are wired in parallel with each other and in series with the entire switch system so that both upper switches must be open to turn the feeder off.

Only rarely is the back pressure problem nonexistent. One case is where a feeder is used to supply parts to a belt conveyor as in a visual inspection. In this type of setup the parts are carried away as fast as the feeder can deliver them and have no opportunity to back up in the feeder bowl.

As the trend toward automation grows, machine production rates are climbing higher and higher. Almost overnight a problem has arisen of providing sufficient bulk storage for parts in the handling system. With lower production rates, keeping the bowl filled with parts was no great matter. With increases in production rates, however, bulk storage is an important part of the system.

Considerable effort has gone into development of suitable storage hoppers to operate in conjunction with the vibratory feeders. Initially the so-called "chicken feed" type hopper, mounted directly above the bowl, was used. It was found, however, that about 85 percent of many parts eventually would combine themselves in such relative orientations as to produce a jamming condition between the bottom of the hopper and the bottom of the bowl. To overcome this problem an offset type hopper is now used, *Fig.* 5.

With this setup the hopper vibrator is controlled by a bowl-level control switch so that as the level of parts in the bowl fills up, parts deflect a paddle arm, opening the switch to turn the vibrator off. As the level of parts in the bowl goes down, the paddle arm swings back, closing the switch to turn the vibrator on. This has proved to be an exceptionally workable design and is remarkably free of jamming.

These are some of the major considerations in designing a feed system to fit a specific application. While there often are similarities in parts which permit a carry-over of experience, in most instances each application must be designed around the specific part to be fed, for best results.

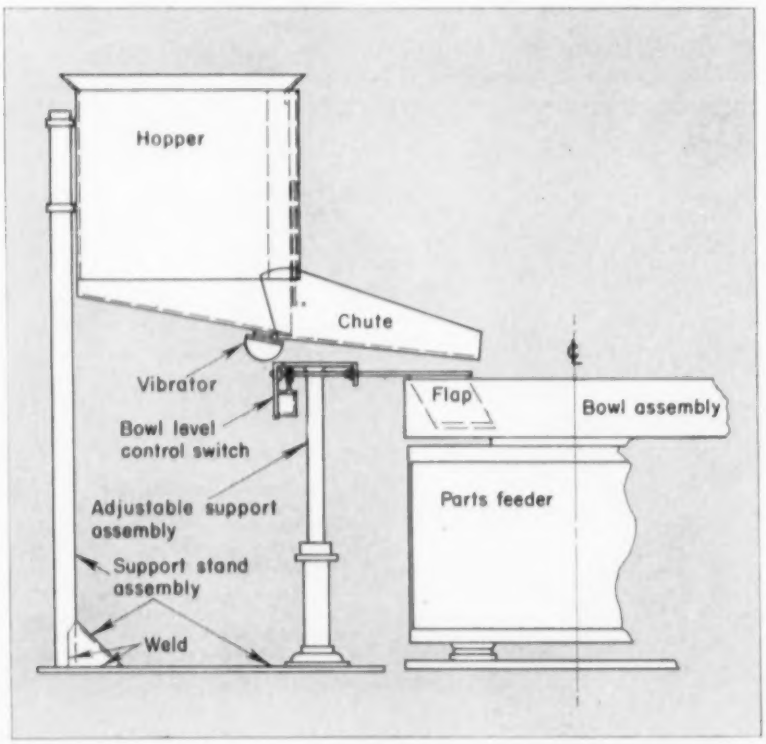


Fig. 5. Hopper for bulk storage with offset arrangement to avoid jamming of parts. Automatic control is provided so that parts are maintained between minimum and maximum levels in the bowl.

thread rolling

-improves part quality

-cuts production costs

By Clifford T. Appleton
Vice President
Reed Rolled Thread Die Co.
Worcester, Mass.

Although the thread-rolling process has been in existence for over one hundred years, new applications are still being developed. The author summarizes the advantages of thread rolling and discusses modern thread-rolling methods and equipment. Some interesting applications are also covered.

ROLLING IS THE FASTEST method of producing screw threads and, since threads are formed by displacement of metal rather than by cutting, less material is required than for other methods of screw production. In addition, a high degree of uniformity and accuracy can be obtained with thread-rolling equipment. The process can be adapted for rolling oil grooves and annular rings, for burnishing and crimping operations, and for producing splines and serrations. Some typical rolled parts are shown in *Fig.* 1.

Characteristics of Rolled Threads: Rolled threads are stronger than physically equivalent machined threads. During rolling, cold working takes place, improving the tensile strength by as much as ten percent. Rolled threads also have high

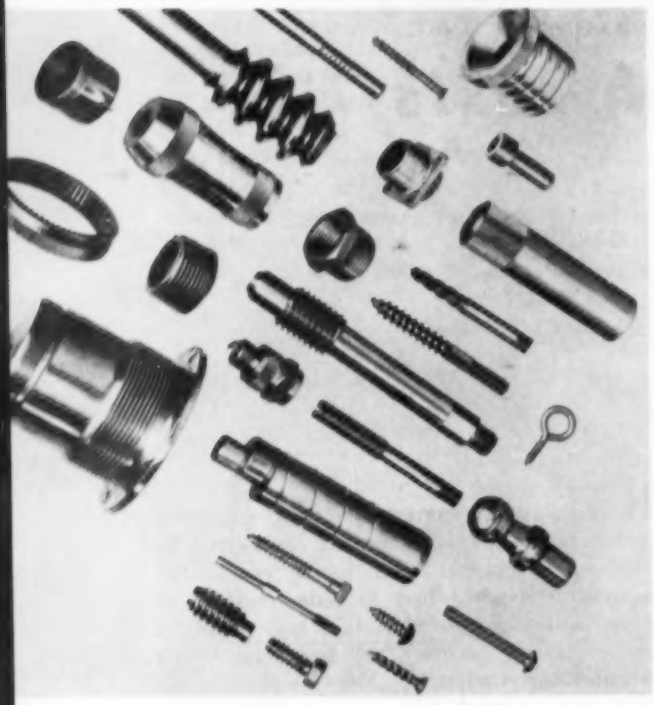
Abstracted from Paper 11, "Fundamentals and Application of Thread and Form Rolling," presented at the 25th ASTE Annual Meeting. Copies of the complete paper are available for purchase from Society Headquarters.

resistance to stripping because the longitudinal fibers of the blank are re-formed, rather than cut, during the rolling process, *Fig.* 2. The resulting grain pattern gives high shear strength.

Rolled threads are also characterized by high fatigue strength. During rolling, compressive stresses are built up in threads, particularly in the root areas. These stresses oppose tensile stresses which might lead to fatigue failure. A second factor improving fatigue strength is the absence of cutter marks or tears, which often act as stress raisers and starting points for fatigue cracks in machined parts. It has been reported that fatigue strength of parts with rolled threads is as much as 75 percent greater than the fatigue strength of identical parts produced by conventional methods. Fatigue strength of bolts hardened to R_C 36-40 prior to rolling is five to ten times that of bolts with cut threads. The high strength-to-weight ratios of fasteners with rolled threads have resulted in their extensive use in aircraft.

Smoother surface finishes can be produced by thread rolling than by any other method of producing threads. During rolling, there is a burnishing action which tends to make the surfaces of the threads even smoother than the surfaces of the dies. A comparison of typical surface finishes produced by common threading methods is shown in *Fig.* 3.

The accuracy of rolled threads depends on the accuracy of the blank, the dies used, and the machine and setup. Classes 1A, 2A, 3A, 5 and other precision threads are all commonly produced by thread-rolling methods. Unlike other threading tools, thread rolls do not wear appreciably in service. Wear on thread-rolling tools is distributed over a large surface, rather than being confined to cutting edges, and due to the rolling action, there is little friction between dies and workpieces. Consequently, thread-rolling dies do not require sharpening and generally produce accurate threads consistently throughout their service life.



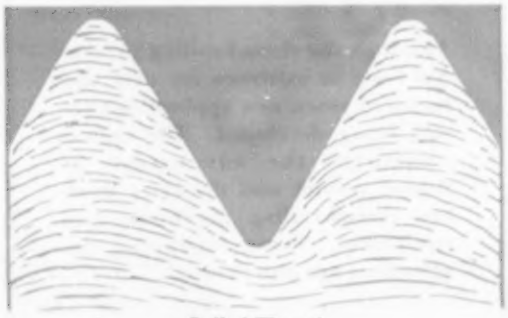
Thread-Rolling Methods: Most thread-rolling operations are performed on special thread-rolling machines or on automatic screw machines. There are three basic types of thread-rolling machines: reciprocating-die machines, rotary-planetary-die machines and cylindrical-die machines. Tooling for each type of machine is shown in the accompanying chart, which also shows tooling for thread rolling on screw machines and turret lathes.

Reciprocating-die machines utilize two flat dies, one stationary and one moving. One part is produced with each stroke of the moving die. These machines, widely used for threading bolts, are

Fig. 1. (left) Rolling can be used to produce a variety of threaded and other forms.

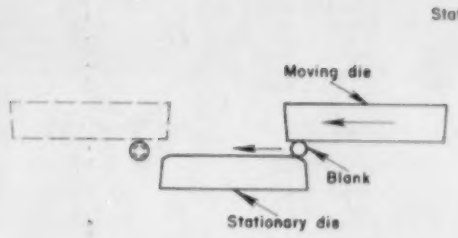
Fig. 2. (below) In rolling, longitudinal fibers are re-formed, rather than cut, giving increased strength.

Cut Thread

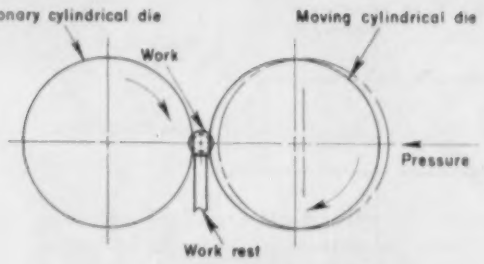


Rolled Thread

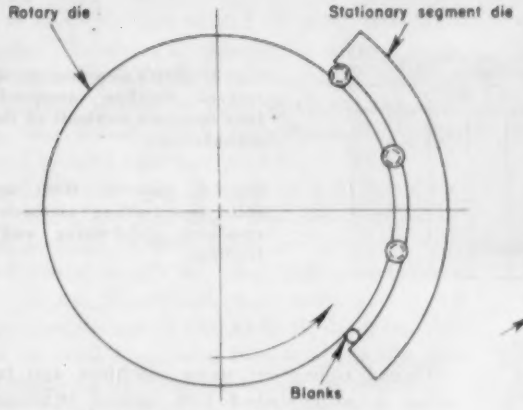
Types of Thread-Rolling Machines



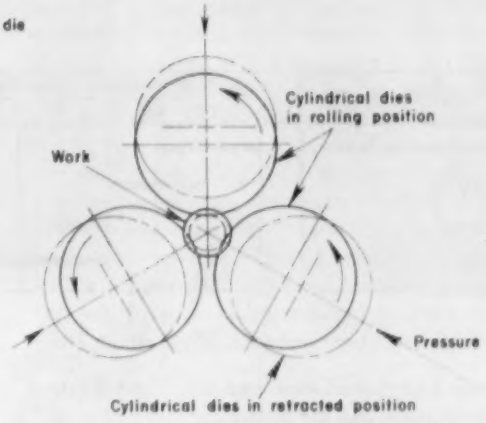
Reciprocating-Die Machine



Cylindrical-Die Machine
(two dies)

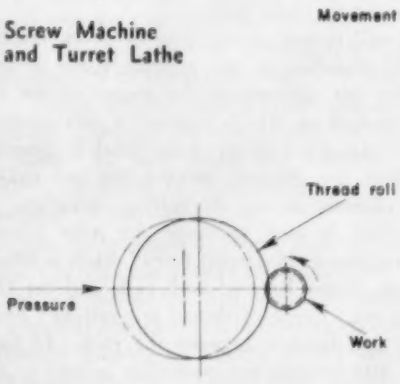


Rotary-Planetary-Die Machine

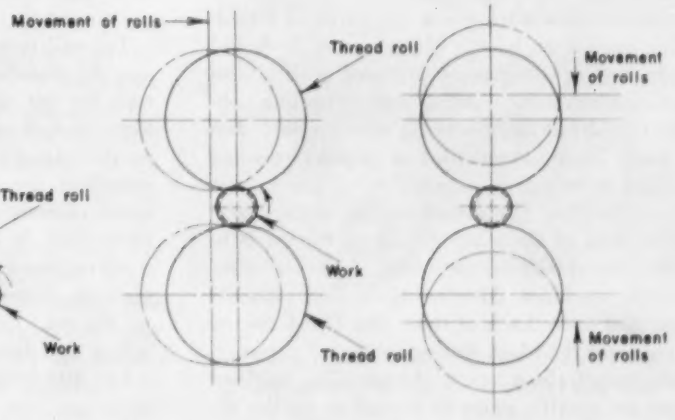


Cylindrical-Die Machine
(three dies)

Screw Machine and Turret Lathe

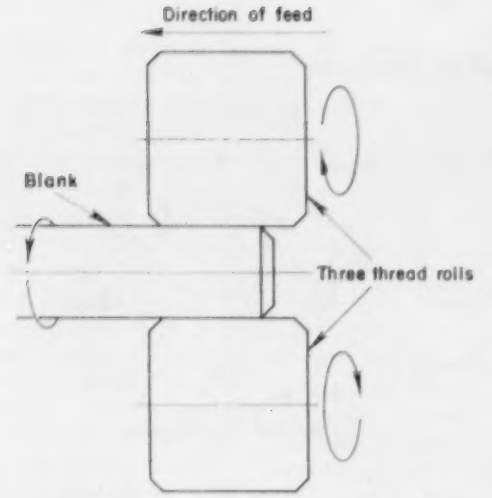


Single-Roll
In-Feeding

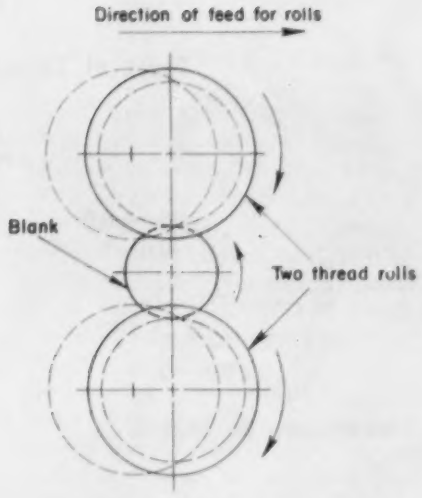


Tangential
In-Feeding

Radial
In-Feeding



End feeding with self-opening thread rolling heads



Infeeding with two roll attachments

Production Method	Surface Roughness (Microinches, rms)							
	250	125	63	32	16	8	4	2
Screw Machine Chasing								
Milling								
Grinding								
Rolling								

Fig. 3. (left) Comparison of the surface finishes produced by four common methods of thread manufacture.

Fig. 4. (above) With thread rolls, two feeding methods are possible: end-feeding and in-feeding.

made in a number of sizes, each for a limited thread diameter range and die length.

Rotary-planetary-die machines, a recent development, have one rotary die, turning on a fixed axis, and one or more stationary segment dies. These machines, like the reciprocating-die machines, are available in several size ranges.

Cylindrical-die machines, a third type of thread-rolling equipment, have a wide range of feeds and speeds, and are frequently provided with attachments for automatic loading and unloading. On some cylindrical-die machines, two opposed dies are used. These are mounted on parallel axes and the blank to be rolled is supported on a work rest between the dies. The axis of one die is stationary, and the axis of the other die moves toward it to produce the thread on the blank. In other cylindrical-die machines, there are three dies, mounted on parallel axes. Each of these dies is fed toward the center of the blank during rolling.

Selection of which type of thread-rolling machine to use for specific parts is dependent on the diameter of thread, length of thread and hourly production rate desired. Pertinent information on the capacity and production rates for all three types of thread-rolling machines is shown in the accompanying table.

Thread rolling on screw machines and turret lathes is accomplished with in-feed attachments, utilizing one or two thread rolls, or with self-opening heads for end-feeding. *Fig.* 4. When a single roll is used, pressure is applied radially on the blank, with the roll feeding directly toward the center of the blank. Thread depth is controlled by positioning the cross slide.

Two-roll in-feed attachments for screw machines may be classified in two groups; those in which rolls are fed tangentially, by means of the cross slide, and those which contain a mechanism to provide radial in-feeding of the rolls. In tangential in-feeding, the distance between the two rolls remains constant during the rolling operation. The cross slide is used to move the rolls across a revolving blank. Maximum thread depth is attained when the center lines of both rolls and the blank are aligned. Depth of thread is controlled by adjusting the distance between the rolls. In radial in-feed attachments, the cross slide is used to align the center line of the rolls with the center line of the blank. Both rolls are then fed toward the center of the blank. Depth of thread is controlled by adjusting the amount of the radial in-feed movement.

Self-opening end-feeding thread-rolling heads are

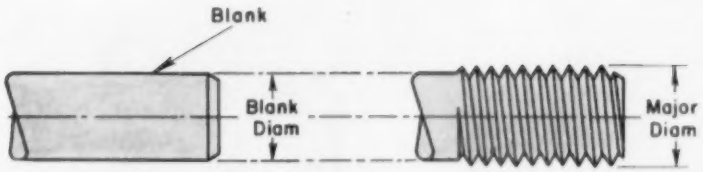


Fig. 5. Diameter of blank is usually smaller than maximum pitch diameter of thread.

similar in design to self-opening die heads. Some heads are designed to rotate around a stationary blank; other types of heads remain stationary as the blank revolves.

Thread-Rolling Dies: The general design specifications for dies or thread rolls depend on the equipment and machine attachments selected for a job. Detailed design is, of course, dependent on the specifications of the workpiece.

Ordinarily, it is necessary to make a separate set of dies for each thread diameter and pitch specified; however, if threads on several workpieces have the same pitch and the thread diameters are similar, it may be possible to use the same dies. For lowest tooling cost, standard-size dies should be used whenever possible.

Even when it is unnecessary to hold threads to close limits, precision-made dies and rolls are always desirable. Precision dies can be set up more quickly and accurately, thus minimizing down time. It has been found, also, that accurate dies have a longer service life, so in the long run they may be more economical than less accurate dies. For precision work, precision dies are essential.

Preparation of Blanks: Even with precision dies or rolls, poor results may be obtained unless blanks are manufactured to close tolerances. Since rolling does not remove or compress material, blanks should normally contain no more material than is necessary to form the finished thread. In general, blank diameters are smaller than the pitch diameter of the thread, *Fig.* 5. When rolling short thread lengths, however, especially in soft materials, there may be some endwise stretching of the blank. In such cases, the diameter of the blank is increased to obtain sufficient radial displacement of the material.

Blanks for common fasteners such as bolts, cap screws and machine screws are usually cold-forged in heading machines. With carbide heading dies, the required accuracy can be maintained. Another method of preparing blanks is by shaving, usually on a screw machine. Blanks made from hard materials are centerless-ground, particularly when accurate threads are required.

Ends of blanks are normally beveled to prevent chipping of the rolling dies. A bevel of 30 degrees from the axis of the blank, giving a 60-degree included angle, is preferred. The diameter at the small end of the bevel is smaller than the minor diameter of the thread.

Preferred Forms for Rolling: Because of the nature of thread-rolling operations, some thread forms are more easily rolled than others. When thread roots are narrow, the workpiece material readily flows along the flanks of the thread form. Forming a wide, flat-root shape in the workpiece requires considerably more pressure, since the material at the center of the flat area must be displaced a considerable distance in order to flow around the edges. If it is necessary to roll threads with wide root-flats, rolling can be facilitated by designing the thread with radii at both ends of the flat, or, if possible, with a full-radius root.

American Standard and similar thread forms with narrow root flats can be readily rolled. Threads for lag screws, wood screws and self-tapping screws have wide root flats. They are usually rolled with flat or planetary dies designed to form a narrow flat, which is gradually enlarged to the required width as the workpiece progresses through the die.

Comparative Production Rates for In-Feed Rolling of Soft Steel Blanks (pieces per hour)

Thread Diameter (inches)	Rotary-Planetary-Die Machines	Reciprocating-Die Machines	Cylindrical-Die Machines
0.125	400-1600	60-175	21-100
0.25	400-1200	60-125	21- 90
0.50	150	60- 80	26- 70
0.75	—	40- 60	21- 40
1.0	—	30	16- 25
2.0	—	—	6- 16
3.0	—	—	4
4.0	—	—	4

Worm threads with a 40-deg included angle and 20-deg pressure angle are easier to roll than worm or Acme threads with 29-deg thread angle and 14½ deg pressure angle. When designing worms which will be produced by thread-rolling methods, it is desirable to make the major diameter of the worm thread at least six times the full depth of thread. Full consideration of the characteristics

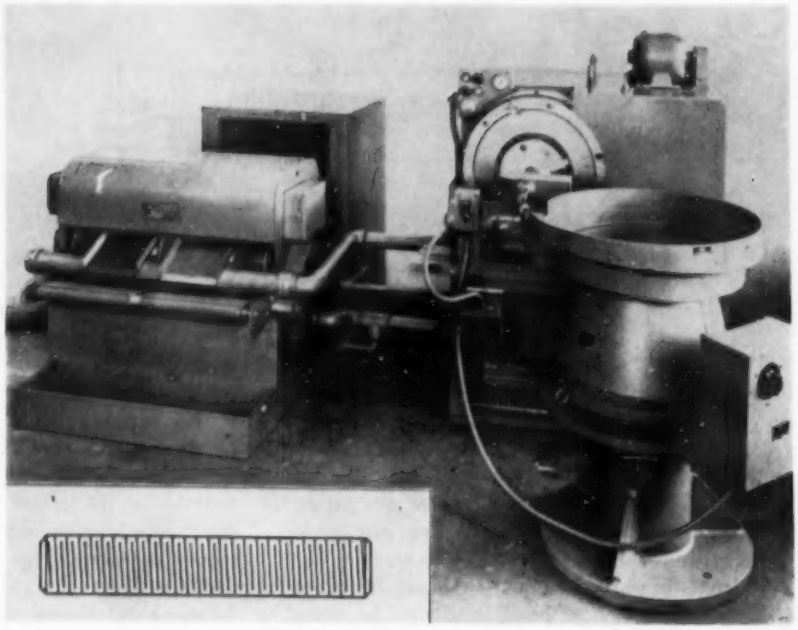
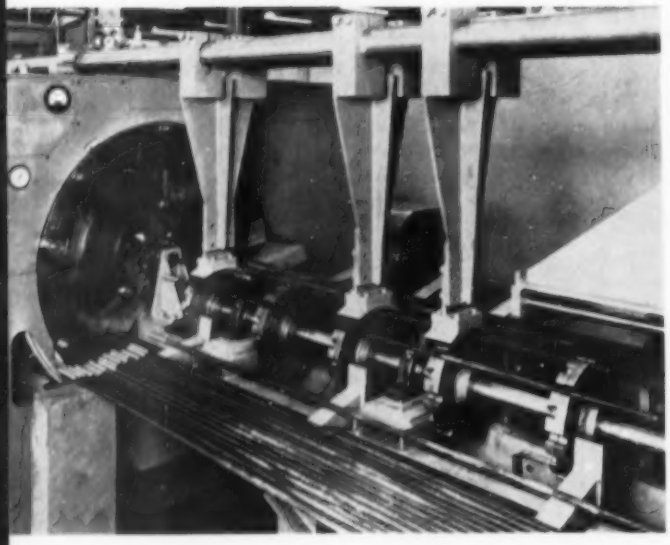


Fig. 6. (right) Hopper feeding makes thread-rolling operations on short studs fully automatic.

Fig. 7. (below) Eight-foot rods are automatically threaded with the aid of special automatic equipment.



of the thread-rolling process when designing threads will lead to more satisfactory production.

Applications: As already pointed out, the increase in the number of thread-rolling applications is due to the accuracy and strength of rolled threads, the speed of thread-rolling operations and savings in material. When extruded or cold-headed blanks are used, there is virtually no wasted stock. Material savings range as high as 27 percent, compared with cut threads.

The already high productivity of rolling operations can be increased still further by use of hopper feeds or other automatic loading devices. The hopper-fed cylindrical-die machine illustrated *Fig.* 6, is equipped for rolling threads on studs used for oil-line connections. The studs range from two to eight inches in length and are heated-treated to R_C 32 prior to rolling. After blanks are loaded into the hopper, they are automatically fed into the machine, threaded and unloaded. Coolant is used to maintain constant rolling temperatures. Production is from 70 to 150 inches of thread per minute. With blank diameters approximately the same as the pitch diameters of the threads being rolled, material savings range from 15 to 20 percent.

Special loading and unloading devices are also used for long parts. The cylindrical-die machine shown in *Fig.* 7 is used to produce threads on the ends of mine roof bolts up to eight feet in length. Rods are loaded onto a rack and are then automatically transferred to threading position, threaded and unloaded at the rate of 18 parts per minute.

The rods are of hot-rolled steel, which is cut to length by shearing. If the rods were threaded in this condition, damage to the threading dies might result. This problem has been solved by rolling a bevel on the end of the rod when rolling the thread.

Discussion has been limited to only a few of the many phases of thread rolling. With existing equipment, thread diameters ranging from less than 0.0625 to more than 4.5 inches, and with 2 to 80 threads per inch are being successfully rolled. These ranges will doubtless be extended with further developmental work.

designed for

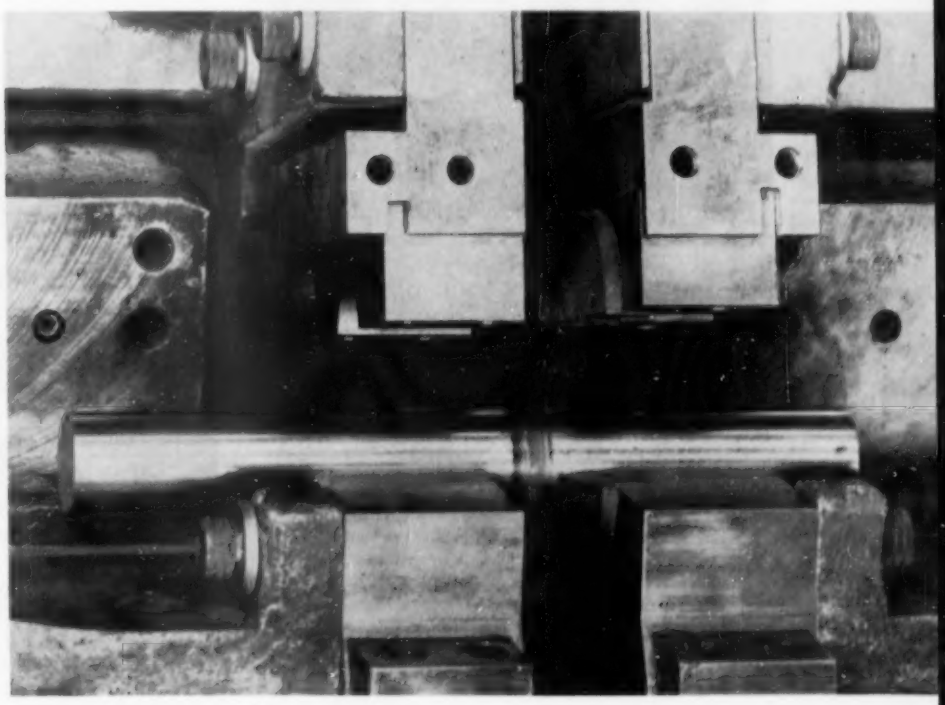
PRODUCTION

Resistance Welder Trims the Flash After It Makes the Weld

This flash welder trims the flash extrusion immediately after it is formed. Since the time for shearing flash is short, there is no appreciable difference in production welding rates when this machine is compared with conventional flash welding equipment. This welding cycle avoids postwelding cleaning operations, and the expense and time such cleaning requires.

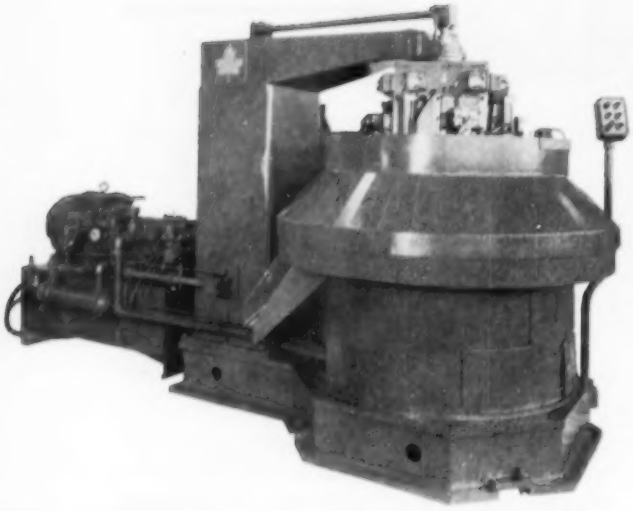
The Synchro-Shear welder, developed by Thomson Electric Welder Co., will handle carbon steel from mild to 1 percent carbon, and high-speed, high-alloy and stainless steels. It can be used for welding dissimilar metals. It will weld and trim all shapes normally encountered in flash welding, including flats, squares, rectangles, rounds and ovals, and many irregular or extruded shapes.

Trimming dies must be made up for each size and shape of weld. When a highly finished product is desired, the trimmed weld area is worked in the same way as the rest of the part.



SHEARING is an integral part of the welding cycle and follows immediately after the upset motion. Grip of the trimming dies on the workpiece is slightly reduced, while the grip of the other dies is maintained, after the upset step so the workpiece is pushed through the trim die and the flash is removed while still hot.

DESIGNED FOR PRODUCTION



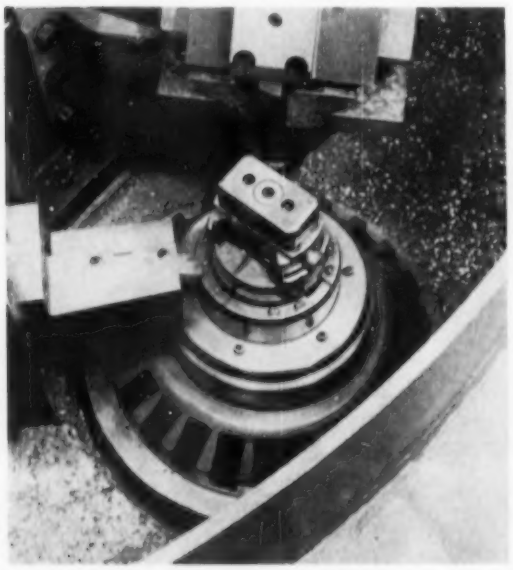
PRODUCTION of 1200 scalped pistons per hour results in so many aluminum chips that the entire operation is enclosed in a shield. Chips are forced out a chute at the back, by paddles traveling in a circular trough surrounding the worktable, and are carried away on a conveyor.

MULTISPINDLE MACHINE

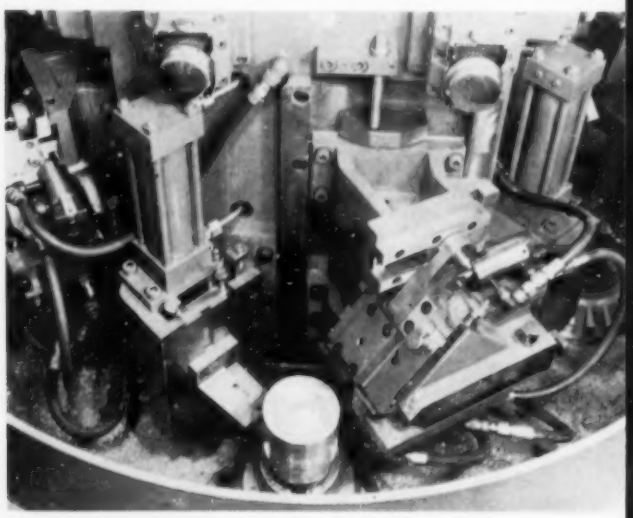
rough turns pistons at high rate

With four spindles and a semiautomatic production cycle, aluminum pistons can be scalped at a rate five times that possible with single-spindle equipment. The worktable of this machine rotates continuously. All movements at the four work stations are controlled by a hydraulic valve in the center column. As each spindle of this machine, developed by Standard-Modern Tool Co., Ltd., (Canada), passes the operator, he removes a scalped piston and puts on a casting.

Individual work spindles rotate at 2000 rpm during turning steps. After tool slides retract, the work spindles are stopped, then rotated backward at 5 rpm until a shot pin engages a slot in the underside of the spindle flywheel. The spindle is thus always stopped at the same point to facilitate loading and unloading.



PISTON CASTINGS are manually placed over an expanding chuck that locates on the inside of the casting. Steel fingers move out to engage wrist pin holes, securely clamping the piston during the heavy cuts. Vertically mounted chucks are actuated by a hydraulic cylinder designed into the work spindle.



SCALPING is performed by two hydraulically actuated tool slides, each of which is independently controlled. Maximum piston dimension is 5 inches for both length and diameter. The vertical tool, at left, turns the skirt of the piston while the inclined tool machines the dome flat, undercut or domed, according to the shape of a cam bar.

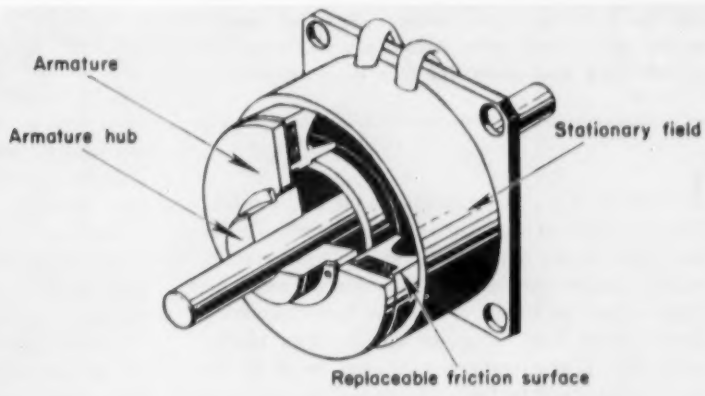
Electromagnetic Clutches and Brakes Start and Stop Card Punch Fast

Low inertia clutches and brakes operate 100 times per minute in the Univac 60-120 so they have to be designed for rapid, dependable operation. Electro-magnetic units have proved usable and long-lived. The computer is actually two units. One senses and punches, the other computes.

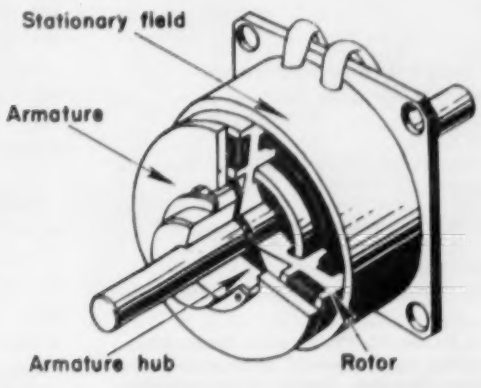
The first unit reads values and instructions already punched into the cards and sends these to the computing unit. Necessary calculations are performed and results are returned to the first unit for punching into the card. The card must be stopped the instant information is to be punched into it.

These brakes, developed by Warner Electric Brake & Clutch Co., stop a card in 20 milliseconds (18 deg of lag). With these brakes and clutches, it is possible to process 100 cards per minute, compared to a possible maximum rate of 150 cards if no stops were made.

BRAKE unit is mounted to a motor frame, casting or other rigid surface by means of a flange. The armature is driven by a splined hub, mounted on a rotating shaft. Braking is accomplished by positive engagement of armature and replaceable face, mounted to magnet.



CLUTCHES are in two designs — flange-mounted and bearing-mounted fields for split-shaft application. Friction drive is through armature disk and rotor. When field is energized, magnetic flux flows through rotor and attracts the armature disk.



POLYAMIDE RESIN ALLOYS and tooling applications

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Epoxy resins have increased the areas in which plastics may be applied in metalworking. However, there are many drawbacks to using straight epoxy resins. The authors discuss mixing a polyamide with the epoxy resin and then give some applications to which this new material has been applied.

IN THE PAST few years, plastics have firmly established themselves as important components of tools and dies. Acting not merely as replacements for metal, plastics also perform jobs which cannot be done as well by metals. Numerous formulations of epoxy resins have increased the types of plastic tools, *Fig.* 1, and, through continued research, the scope of uses will be further increased. Commercial application has already indicated that there are both advantages and disadvantages in the use of plastic. Some advantages of epoxy resins in plastic-tooling applications are:

low shrinkage
high physical strength at room temperatures
ease of reinforcement with glass fibers
good machinability
stability toward light
resistance to chemicals, coolants and cleaning compounds
excellent adhesion.

However, they also have some disadvantages:

brittleness (poor impact resistance)
high exothermic reaction (short pot life, blowholes)
low heat resistance (excessive wear and distortion at high-friction areas)
high cost
critical sensitivity to errors in addition of amine hardeners
toxicity of amine hardeners (dermatitis).

In an effort to minimize the disadvantages and maximize the advantages of epoxy resins, various "alloys" have been formulated. In actual practice, polyamide resins come very close to satisfying the requirements of a good alloying material. Characteristically, this class of resin possesses outstanding impact resistance, abrasion resistance and toughness. Nylon is typical of this class of resin.

Such resins are produced by reacting polyfunctional fatty acids with polyfunctional amines. A long branched-chain molecule is formed which consists of fatty acid chains joined together by a series of reactive amino amide groups. The reactive amine groups are capable of combining chemically with epoxy resins to form a type of plastic alloy, *Fig.* 2.

Polyamide and epoxy resins can be blended in commercial paint shakers, in a proportionating mixing type of pump or by hand mixing for smaller batches. The two resins are weighed in proper amounts into a container, stirred for about three minutes and are ready for application. After pouring or laminating, they set in about ten minutes at 300 F, 30 minutes at 200 F or from two to four hours at room temperature.

Increased Flexibility: Key to the unique properties of this alloy is the presence, in the structure, of the fatty acid chain. This chain acts as a flexible "hinge" which connects the epoxy resin molecules. Since this hinge is cross linked into the structure, it acts as a permanent built-in impact absorber. Of considerable importance is the fact that the polyamide can be mixed with epoxy resins in a wide range of ratios to produce a series of alloys having

Abstracted from Paper 40, "Polyamide Resin Alloys in Practical Tooling Applications," presented at the 25th ASTE Annual Meeting. Copies of the complete paper are available for purchase from Society Headquarters.

different degrees of flexibility. At a 35:65 ratio of polyamide to epoxy, the cured alloy will be hard and rigid, yet impact resistant. At a 70:30 ratio, the cured alloy will be extremely flexible and it will retain its toughness. Unlike ordinary plasticizers or flexibilizers, polyamide cannot bleed out to interfere with performance later on.

Ratio of Resins: Other curing agents have been added in amounts of 5 to 15 percent of the weight of the epoxy in making tools. At this level, a small error in weighing can have an important effect on the properties of the finished casting.

With polyamide, however, the two resins are added to each other in approximately equal orders of magnitude. An error of plus or minus 5 percent in the ratio of polyamide to epoxy is not usually significant since alloys containing a ratio of 30:70 have neither a shortage nor an excess of "free" reactive molecules. Furthermore, as both the poly-

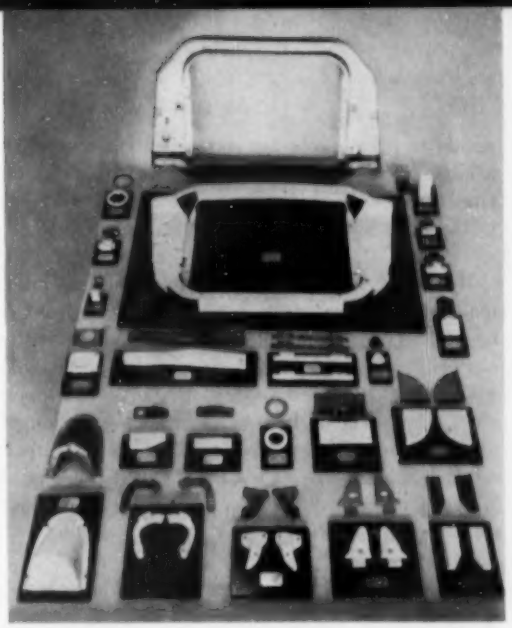


Fig. 1. Various sizes of checking fixtures produced from polyamide-epoxy resins.

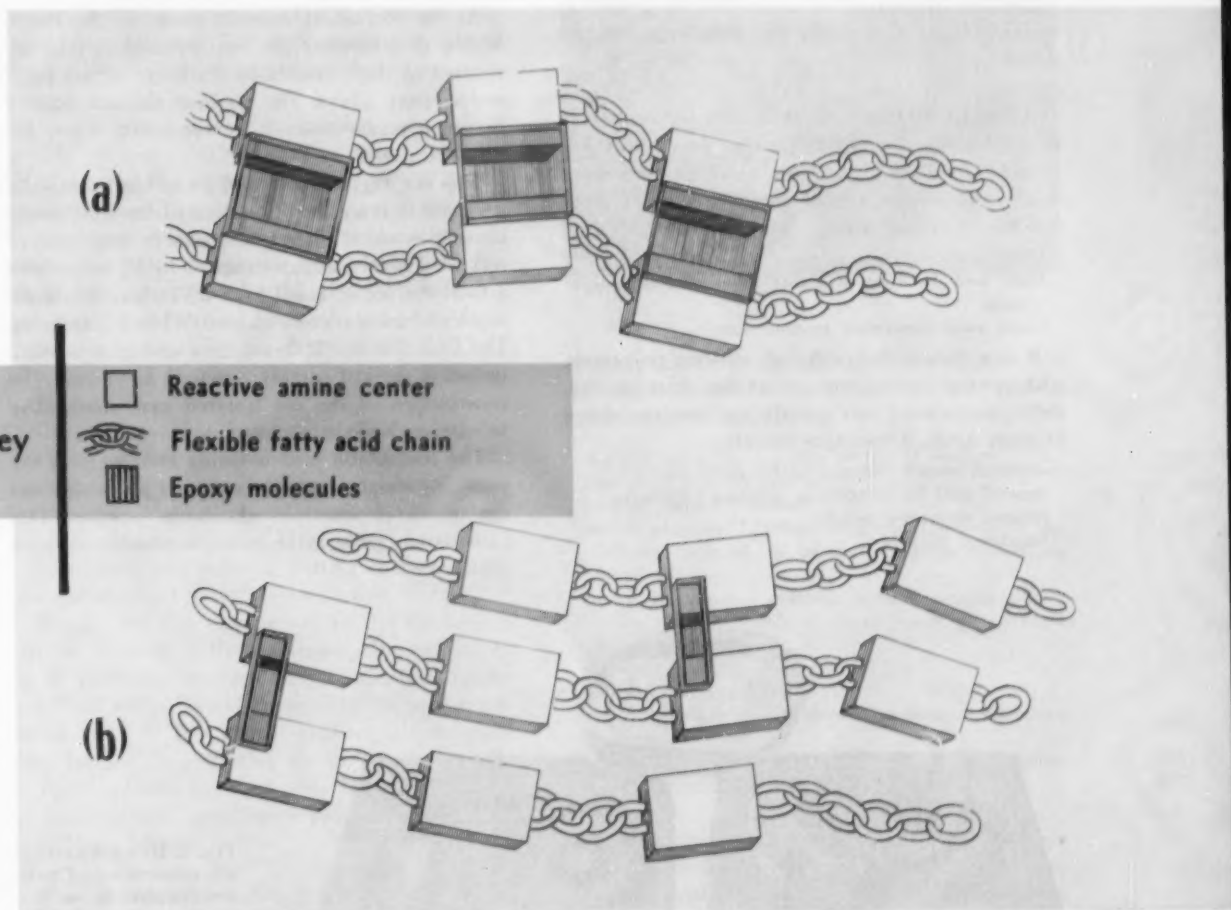


Fig. 2 (a) The polyamide molecule reacts completely with the epoxy molecule. The ratio of polyamide to epoxy is about 30:70 and, even though the cured resin has a Barcol hardness of as high as 75, the flexible fatty acid chain gives high impact strength. (b) In this chain reaction the ratio of polyamide to epoxy is about 70:30. In spite of a large number of unreacted amide molecules, there are no unreacted epoxy molecules. The polyamide is not free to migrate since, even at this ratio, it is cross-linked into the structure. Therefore, variations in formulations do not result in free or unbound resin molecules.

amide and the epoxy are resins in their own right, a slight variation in either direction from the desired ratio only shifts the properties of the alloy in the direction of the excess resin.

Reduced Exothermic Heat: The polyamide molecule, because of its large size, may be said to be somewhat slow moving and "lazy" compared to conventional short-chain amine curing agents. As a consequence it reacts more slowly at room temperature, spreading its heat of reaction over a longer period of time. This results in a lower peak temperature. It makes possible the blending and casting of larger batches with less concern about blowholes, shrinkage or pot life.

Toxicity: Toxicity has been, and continues to be, a serious problem associated with the use of short-chain amines. The presence of the fatty acid chain in the polyamide molecule, however, seems to neutralize the toxicity of the reactive amine groups. Therefore, the spread of dermatitis or any other manifestation of toxicity has been critically reduced.

Alloy Properties: As is usually the case, it is next to impossible to improve the properties of a product from one standpoint without degrading them from another. Some disadvantages of polyamide-epoxy alloys are:

higher viscosity
lower heat distortion at higher ratios of polyamide to epoxy
longer room-temperature reaction time.

It is apparent that, although alloying polyamide with epoxies cannot cure all of the shortcomings, their combination can greatly increase usefulness in many areas. Advantages include:

improved impact resistance of the cured alloy
reduced need for accuracy in weighing hardeners
reduced exothermic activity
lengthened pot life
nontoxicity
controlled permanent flexibility.

In addition, polyamides enhance, rather than detract from, the excellent adhesive properties of epoxy resins. Their highly polar nature gives them excellent adhesion to a wide variety of surfaces—even wet or damp surfaces under certain conditions. Since these resin alloys can take complete advantage of reinforcing materials, more even distribution of load throughout the finished product can be achieved.

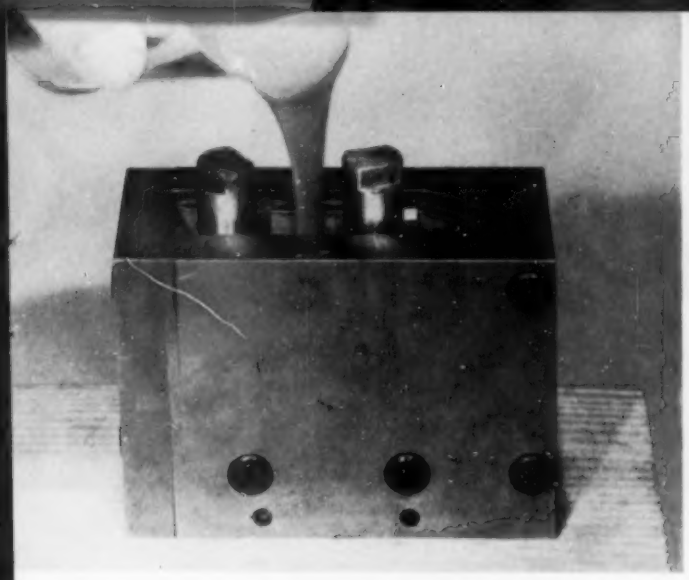
Commercial Applications: Polyamide-epoxy blends have been successfully used in the metalworking field for such parts as master models, checking fixtures, draw dies, vise and chuck jaws, spinning dies, drop hammer dies, stretch dies, drill jigs, and trim and routing fixtures. Only a few representative uses will be discussed here, since these demonstrate how the properties of the alloys adapt them to a wide variety of uses.

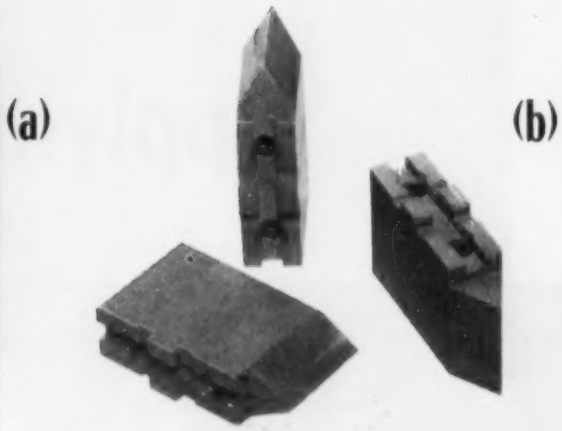
At the McDonald Aircraft Corp. of St. Louis, Mo., a drop-hammer die was designed to take advantage of the controllable flexibility of the polyamide-epoxy alloys. The resilient characteristic of the male punch made it unnecesary to allow for metal clearance.

This die, *Fig.* 3, was actually an experimental die designed to represent a selection of the most severe conditions which might be expected in drop-hammer service. The die measures about 8 by 12 inches with a total surface of about 17 x 20 inches. Maximum depth of draw was one inch on 0.064-inch aluminum. The form features 16 bends over one cross section, including radii of curvature as tight as $\frac{1}{8}$ inch. The construction of the die featured cast plastic-alloy facings on Kirksite backings or cores.

The female die used a facing consisting of six parts (by weight) epoxy; four parts polyamide and five parts of atomized aluminum powder. This formulation gave maximum compressive strength

Fig. 3. Drop-hammer die constructed of polyamide-epoxy resin.





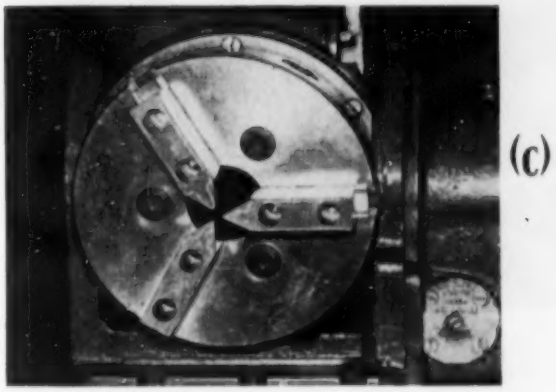


Fig. 4 (a) Polyamide-epoxy chuck jaws being cast. (b) Cured chuck jaws. (c) Chuck jaws in use in the lathe chuck.

and impact resistance coupled with optimum handling characteristics. The male punch was formed using a blend of six parts polyamide to four parts epoxy.

Drop hammer dies of polyamide-epoxy alloys absorb extremely high operating stresses without chiping, cracking or wearing. The plastic facing produces smooth parts which are free of wrinkles. Furthermore, these plastic-alloy combinations do not become brittle as do some other plastic materials which have been tried for this type of service.

A variety of checking fixtures produced from polyamide-epoxy alloys are shown in *Fig.* 1. These were produced by the Callon Corp. of Windsor, Canada.

This company has found these alloys ideal for this use because of absolute reproduction of dimensions due to extremely low shrinkage. Also, low-moisture absorption and excellent aging characteristics insure retention of accuracy. Because of low shrinkage and superior wetting characteristics, there is excellent surface reproduction.

Chuck jaws, *Fig.* 4, produced by the Mechanical Div. of General Mills in Minneapolis, proved to be of particular interest. In this application, the ability of the polyamide to modify the epoxy was called upon so that tough, resilient plastic parts were formed. By adjusting the ratio of polyamide to epoxy, chucks having exactly the right amount of hardness and "grip" were produced for use on Bore-Matic lathes.

Plastic Solders: Although plastic solders may not fall strictly under the tool and die category, there are many areas where solders and tooling compounds overlap each other's functions.

Plastic solders are finding increased use in auto body repair. The excellent properties of the polyamide-epoxy alloys in this application insure that this trend will continue and expand. Plastic solders based on these alloys have:

- excellent adhesion to a wide variety of surfaces
- good thermal shock resistance
- excellent impact resistance
- built-in corrosion inhibition properties (particularly significant in repairing metal body parts exposed to weather)
- curing characteristics adaptable to rapid, elevated temperature cures. (Nonvolatile curing agents permit rapid cures without foaming.)
- low shrinkage
- excellent machinability
- excellent paintability (no bleeding to interfere with paint adhesion)
- low toxicity (particularly important since plastic solders are frequently handled by untrained personnel).

These applications show how useful polyamide resins can be for co-reaction with fluid epoxy resins. It is noteworthy that the resultant resin alloys have combined most of the advantages and only a few of the disadvantages of both resins. However, before using this new material, engineers must evaluate each situation and decide what characteristics are necessary.

Applying Ceramics to

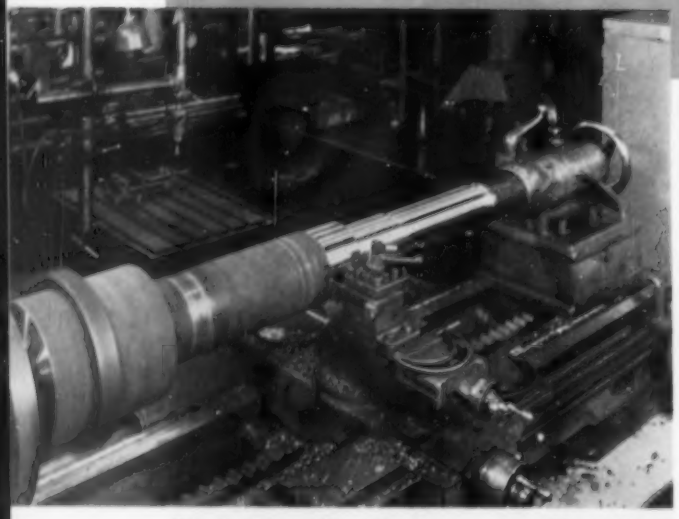


Fig. 1. Three diameters were cut on this pentagon turret part for an automatic chucking lathe. About 230 cu inches of material were removed.

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and
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The authors have used ceramic tools in production operations to learn as much as possible about proper application. Their experiences add much practical information on how to select jobs for ceramics and how such tools can be used.

*Senior member ASTE Cleveland chapter.

Abstracted from Paper 24, "Industrial Application of Ceramic Tools," presented at the 25th ASTE Annual Meeting. Copies of the complete paper are available for purchase from Society Headquarters.

CERAMIC CUTTING TOOLS have a proved industrial use in finishing operations. In fact, they will probably completely replace carbides for continuous finish-turning cuts.

Too often, however, the dramatic savings already achieved with ceramics have resulted from misapplication of carbides or through use of a part that would give the greatest reduction in time. Large increases in cutting speed cannot minimize time for loading and unloading workpieces, and do not necessarily result in a proportionate reduction of floor-to-floor time.

In attempting to determine where ceramics can achieve the greatest gains in cost reduction, it is advisable to determine some operating principles and set up some basic goals. It would be advantageous, for example, for jobs to be transferred from a grinder to an engine or turret lathe if, by using high speeds, light feeds and ceramic tools, blueprint specifications for accuracy and finish could be met. Ceramics may profitably be applied to second-operation jobs on turret lathes where a reasonable amount of cutting length is available. The machining of heat-treated parts, where cutting speeds have to be low with carbides, would be a good application area for ceramics. Ceramics should be considered as a replacement tool for all jobs that are being finish-turned with carbides.

Relatively pure aluminum oxide will probably not be the only material for ceramic tools. It may be that ceramics with other oxide bases will be investigated. Much work is still to be done on ceramic materials and on methods for applying them. Methods will have to be found for attaching ceramic tips to tool shanks, with equipment the average shop might have, because throw-away inserts cannot be used for all jobs. In addition to considering single-point turning applications, engi-

Production

neers will have to study the possibilities of using ceramics in milling cutters.

Single-Point Turning: Each of the jobs to be described was run under normal shop conditions. Speeds, feeds and depths of cut were set on the basis of ceramic cutting tests on test logs. In most cases, the top speed of the machine was used until ceramic tool failure occurred. Speeds were then reduced to limit the failures. Feeds were varied to control the chip and finish.

A plunger tube was the first part investigated. It was anticipated that this seamless, mechanically drawn tubing with a $\frac{3}{16}$-inch-thick wall would provide a good production use for ceramic cutting tools. Cutting conditions and tool characteristics for all the tests are give in TABLES 1 and 2. In addition to using the ceramic tool that successfully cut 16 pieces, TABLE 1, a ceramic from a different source was tried. Applied under the same conditions, this material resulted in chatter due to rapid wear of the nose radius. One plunger tube was cut but it was outside blueprint tolerances. The rest of the cutting tips of this material fractured without doing any useful work.

Production tests were next run on the pentagon column, *Fig.* 1, for the turret of an automatic chucking machine. Power required to cut each of the three diameters of Part No. 2 was the same, 21 hp. All three diameters were cut on two workpieces with one cutting edge. Floor-to-floor time comparisons are made in TABLE 1 to indicate the actual production advantage that could be gained by changing from carbides to ceramics. Percentage reduction of cutting times were larger than reductions shown for complete operations.

A cold-drawn mechanical seamless tube was the third part studied. Ceramics from various sources were used in the production run to determine tool life. Because these tubes were long, the lathe used for this job was equipped with a traveling turret having centering rolls to reduce whip at the center. A ceramic tool from one source was used with a speed of 918 rpm and a feed of 0.0225 ipr. An average of 3.75 cuts was made per cutting edge, with a removal of 290 inches of chip. The tool superintendent preferred another set of conditions—716 rpm, 0.0178 ipr, 13 cuts per edge and 1040 inches of chip—because he was able to produce more pieces per hour with the fewer number of tool changes.

Another ceramic tool material was used at 918 rpm and 0.0169 ipr. This combination made 4 cuts per edge or 314 inches of cut. A third ceramic material averaged 1.62 cuts per edge or 127 lineal inches of cut under the same conditions. An interesting fact was noted during these tests but so far no explanation of it has been determined. One of the cutting edges of a triangular tip always gave better results. Typical tips gave 6, 8 and 3; 1, 4 and 1; and 14, 5 and 2 cuts per edge. If a reason can be found for this condition, it may lead the way to better ceramic tool formulations and fabricating techniques.

Part No. 4 was the center tool slide guide used on 5 and 6-spindle automatics. Prior to the finishing cut under test, these guides had been rough-turned and stress-relieved. With the conditions shown in TABLE 1 and the upper line in TABLE 2, the cutting action was poor. In an attempt to break the chip, feed was increased to 0.015 ipr. When cutting with the 5-deg-negative-land tool, taper resulted but chip formation was good.

Another set of tests was made with a tool having a 30-deg land on the side-cutting edge. One cut was made with good chip control and no measurable tip wear. After the second cut with this tip, a notch was beginning to develop at what would be called the scale line for a roughing cut. For each of the 12 cuts made with this tool, it was apparent that chip control with ceramics is similar to that with carbides because the feed rate had to be adjusted upward to achieve the desired control. When feeds were increased to 0.021 ipr, considerable sparking occurred during cutting though chip condition was good. Under these conditions, however, considerable wear occurred at the edge of the tip. Tips used in these tests had a 15-deg lead angle.

A diagonal roll tube made of AISI C-1045 was the fifth part studied. The tube was $3\frac{1}{2}$ inches in diameter and was rough-turned to $3\frac{7}{16}$ inches. For these tests, $\frac{3}{4}$ by $\frac{3}{4}$ by $\frac{1}{2}$-inch tips were glued to a standard cast-iron shank and given a Kolesov grind, *Fig.* 2. Conditions of the first cut were: 573 fpm, 0.042 ipr and a depth of $\frac{1}{32}$ inch. After cutting $1\frac{1}{4}$ inches along the tube, this tool failed. The

ceramic broke at the glue joint, apparently because of scale on the workpiece.

Further tests were made on this part with a standard strap type negative toolholder with a 1½-inch long, ½-inch-square ceramic slug. Chip breakers ground on the top of the slug consisted of a groove 7/64 inch wide by 0.020 to 0.025 inch deep. Negative lands, 0.005 to 0.008 inch wide, were honed on the side-cutting edge. This tool also failed, sloughing a large portion of the slug apparently because of the scale.

Part No. 6 was a cam-drum shaft having numerous diameters, of which only one was cut with ceramics. The first attempt to cut this hardened material was made with a 1½-inch long, ½-inch-square slug cutting at 950 fpm, 0.015 ipr and a depth of 0.120 inch. A typical chip breaker, *Fig.* 3, was ground in the top of the slug. Failure occurred after only 20 inches of cutting so the speed was reduced to 695 fpm. With the lower speed, only 15½ inches of cut were made before the entire cutting edge sloughed off, *Fig.* 4.

Since these tests on Part No. 6 were not successful, the toolholder was replaced with a design that would accept the insert described in TABLE 2. Using this tool under the conditions indicated in TABLE 1, it was possible to completely cut the one diameter on two shafts. As an additional test, this toolholder was replaced by one using a ½-inch-square insert. Because this toolholder was of lighter construction, chatter developed and the finish was unacceptable.

Next, a ¾-inch square, ½-inch-thick bonded tip was substituted in the operation. This tool, *Fig.* 2, was used with the same cutting feed and speed but with a cut depth of 0.090 inch. The entire length was cut without any indicated wear on the Kolesov tool. A second cut was taken on the same bar, this time with a depth of 0.025 inch and a feed of 0.037 ipr, to bring it to blueprint size. Indications are that this bonded tool has sufficient strength for this type of use.

Milling with Ceramics: Shop tests were made on a new horizontal milling machine with a face-milling cutter using throw-away ceramic inserts, *Fig.* 5. Cutter speed ranged from 880 to 1950 fpm and feed varied from 22 to 39 inches per minute. Cuts on the ends of cold-finished C-1018 bars varied in depth from 1/32 inch. Chip load per tooth varied from 0.0035 to 0.0073 inch.

Results to date have not been satisfactory. Workpiece finish has been fuzzy and burrs have been excessive. Hard cutting developed after a few cuts and chatter was apparent with deeper cuts. The ceramic inserts failed when subjected to 3/32-inch depths of cut. Tests are being continued with this cutter and a new type of cutter to determine what tool and geometry alterations are required so good performance can be achieved. It is currently thought that higher cutting speeds plus negative lands on the cutting edges will improve results.

Bonding Ceramic Tips: Most technical reports on the bonding of ceramics to steel shanks cover the use of a metallizing step prior to silver brazing. Since the authors were familiar with cementing steel to steel in the fabrication of textile machine parts, it was thought that similar techniques might work in bonding ceramics to steel or cast-iron shanks.

With an epoxy cement and bonding temperatures of 200 F, ceramic tips were successfully bonded to tool shanks. These bonded tools were used with positive rake, where forces holding the tip are relatively higher than those for negative rake. The tips were comparatively thick and made successful cuts.

There is probably a definite limit to the thickness of a ceramic tip bonded in this way. If the ceramic is too thin, the temperature at the bond line may become excessive and result in failure of the bond. No attempt was made to determine the minimum tip thickness during these tests but it will be studied at a future time.

Table 1—Production Test Conditions and Results

Test Part (No.)	Test Workpiece Material	Test Diameter (inches)	Test Length (inches)	Objectives and Requirements	Cutting Speed Carbide (fpm)	Cutting Speed Ceramic (fpm)	Feed Carbide (ipr)	Feed Ceramic (ipr)
1	AISI C-1015	2½	33⅜	±0.0025" tolerance	300	553	0.0230	0.0167
2	AISI C-1050 annealed forging	6⅛ 6¼ 8¾	18⅜ 8 29	±0.0025" tolerance pregrind finish	230 250 185	485 535 710	0.018 0.018 0.018	0.015 0.015 0.015
3	AISI C-1015	4¼	78½	roughing & finishing cuts	230 350	750 750	0.018 0.022	0.018 0.022
4	AISI A-4615	3¾	32¼	±0.001" tolerance	185	855	0.012	0.011
6	AISI A-4150†	3¼	24½	±0.0025" tolerance	175	695	0.020	0.015

*Total for all diameters. †Hardened to 269-302 Bhn.

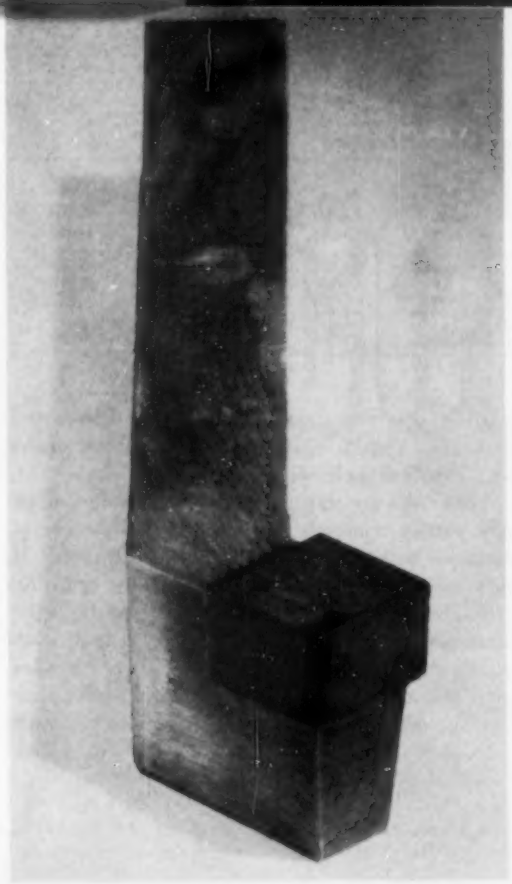
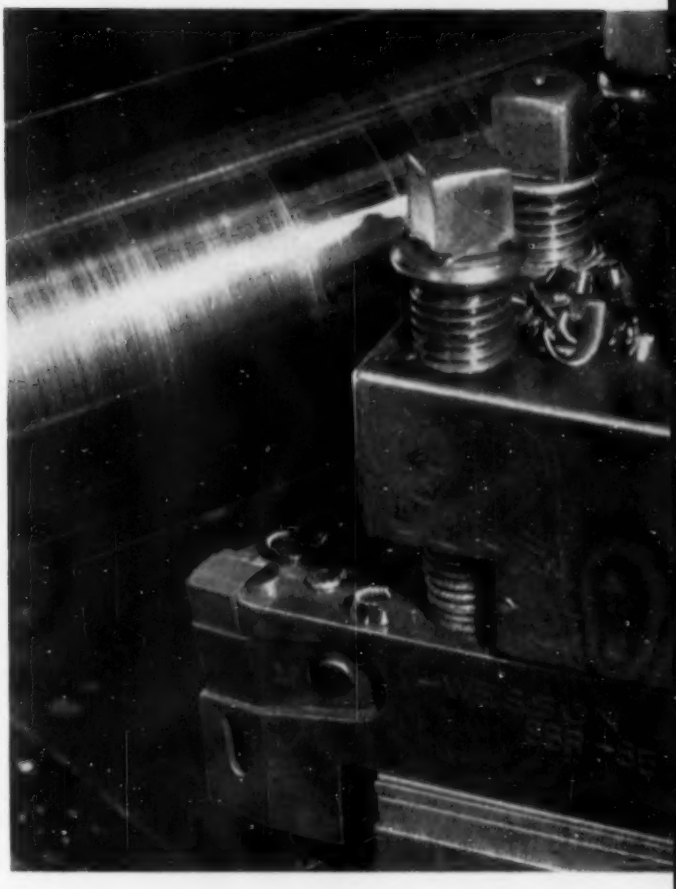


Fig. 2. (left) A standard ceramic tip was bonded to a cast-iron shank and given a Kolesov grind for some of the tests.

Fig. 3. (below) Ceramic slug held in a strap type toolholder prior to early cutting test on Part No. 6.



Conclusions: Based on results of these tests, which were made under production conditions, it can be said that ceramic tools have a definite industrial use in finish-turning operations. With proper care, ceramics can be used successfully for first or second operations on turret lathes. Although currently available, clamp type toolholders are inadequate for use with present ceramics, it is felt that ceramic tool formulations may become tougher and toolholder design will be altered to offset weakness

When Turning Steel Parts with Ceramic Tools

Type of Cut	Depth of Cut Ceramic (inch)	Length of Chips per Edge (inches)	Volume of Chips per Edge (cu inches)	Wear Land Developed (inch)	Floor-to-Floor Time Carbide (hours)	Ceramic (hours)	Reduction (%)
finish	0.039	536	168	0.020	0.133	0.119	10.5
finish	3/32	...	...	...	...	...	...
finish	3/32	108*	230*	0.020*	1.619*	1.299*	19.6*
rough	0.075	...	...	...	...	...	...
finish	0.022	1040*	1495*	0.064*	0.690*	0.322*	53.3*
finish	0.125	390	498	0.008	0.374	0.162	56.8
finish	0.120	49	55	0.008	0.403	0.297	26.3

Table 2—Ceramic Tool Characteristics

Test Part (No.)	Test Toolholder Type	Effective Rake	Slug Length (inches)	Tip Size & Shape	Ground Chip Breaker Width (inch)	Ground Chip Breaker Depth (inch)	Nose Radius (inch)	Honed Land From Vertical of Workpiece (deg)	Honed Land Width (inch)
1	strap	negative	1.5	½" □	0.070	0.015	1/32	30	0.010
2	strap	negative	1.5	½" □	0.070	0.015	1/32	30	0.010
3	clamped	negative	0.25	varied △	clamped	carbide	3/64	0	0
4	clamped	negative	0.25	½" □	clamped	carbide	3/64	5	1/32
5	clamped	negative	0.25	½" □	clamped	carbide	3/64	30	0.012
6	clamped	negative	0.25	¾" □	clamped	carbide	1/32	45	0.005

of the ceramic. Triangular tips are not as well supported as square inserts by current toolholders.

It is probable that interest in ceramic turning would not have developed as rapidly as it has were it not for the clamp type toolholders developed for hard-carbide inserts. These toolholders, however, were not designed with the limiting characteristics of ceramics in mind.

Slugs of ceramic appear to offer no advantages in production operations. When failure occurred with such slugs, excessive amounts of material sloughed off. Cutting fluids were used on some of these tests but no real advantage or disadvantage was noted, except operator inconvenience. It was also found that there are wide differences in performance among the different American ceramic formulations.

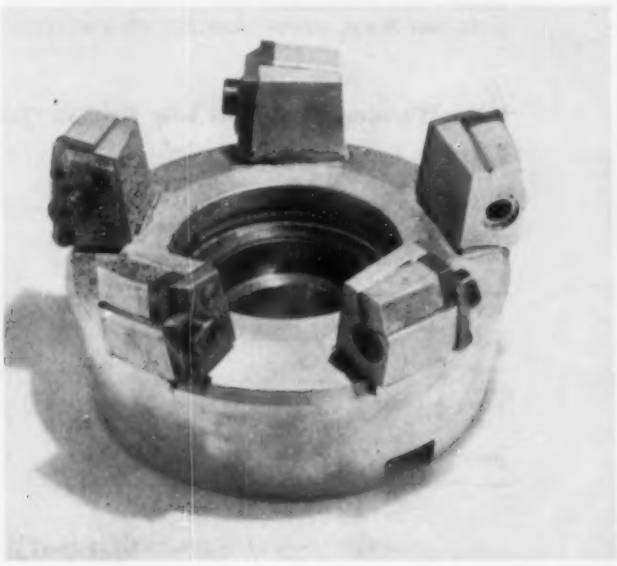
Speed ranges of 400 to 1000 fpm with feeds of 0.004 to 0.020 ipr and depths of cut from 0.010 to 0.375 inch seem to be quite practical with ceramic tools. The use of a negative land on the side-cutting edge, 30 deg from the vertical of the workpiece and ground to a width equal to about 80 percent of the feed rate, definitely improves tool life.

Those who are responsible for the introduction of new cutting materials should approach the use of ceramics with a strongly conservative attitude. If they expect too much, early failures may cause rejection before all of the merits of these ceramic materials can be truly evaluated. Numbers of companies did not continue the use of early carbides after initial failures and it took them a long time to reintroduce these materials that have set such an amazing production record. Repetition of such mistakes should be avoided.

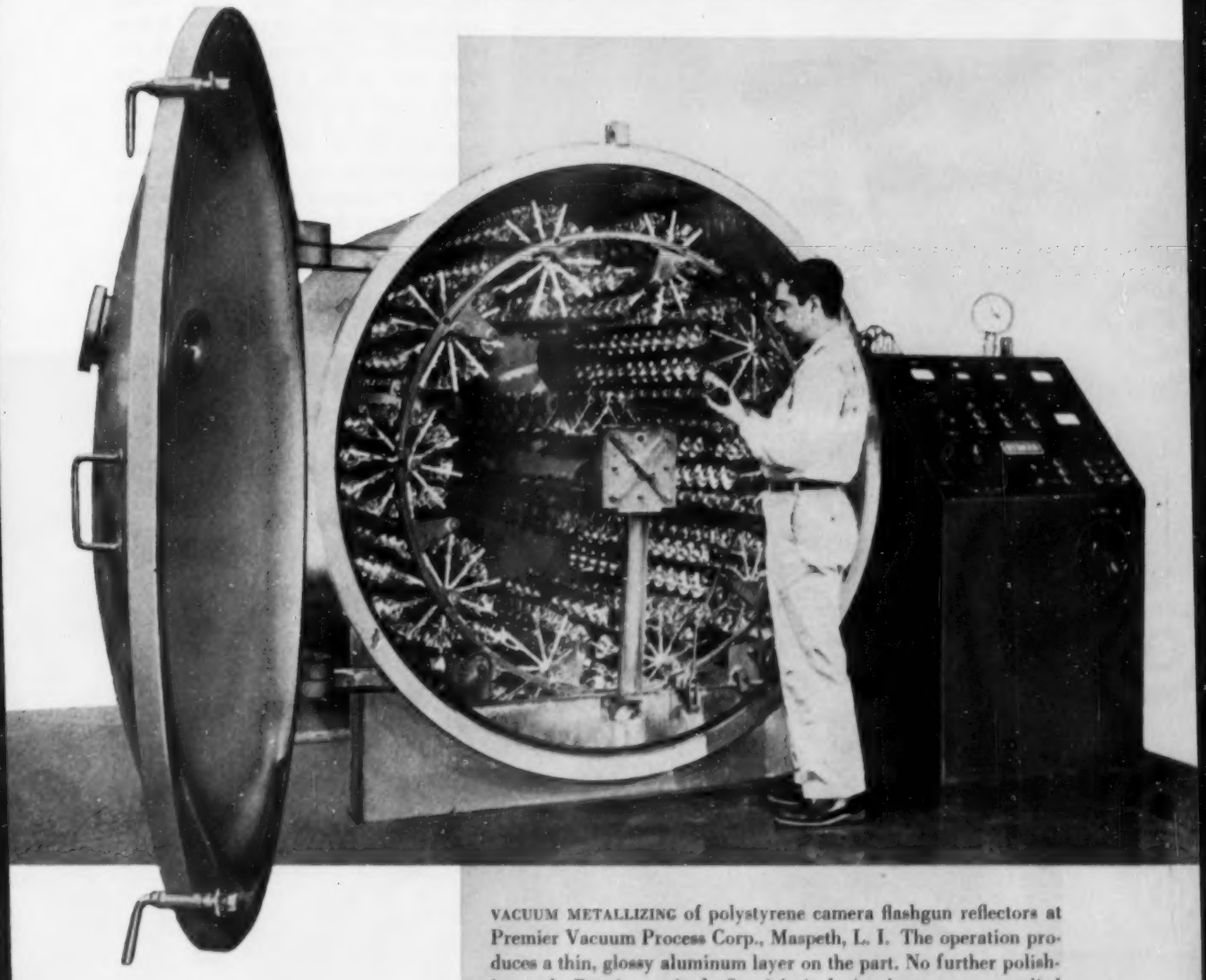
Acknowledgments: The authors extend thanks to the employees of Warner & Swasey who enthusiastically cooperated to obtain these results. Carboloy, Dept. of General Electric; Stupakoff Ceramic and Mfg. Co.; U. S. Ceramic Tile Co.; Wendt-Sonis; Norton Co.; Vascoloy-Ramet Co.; American Lava Products, and Wesson Co. are also thanked for their quick delivery of tools and special ceramic shapes which made these tests possible.

Fig. 4. (left) Ceramic slug that failed during early cutting tests on Part No. 6.

Fig. 5. (below) Face-milling cutter, used with throwaway ceramic inserts, did not produce good finish when milling the ends of cold-finished C-1018 bars.



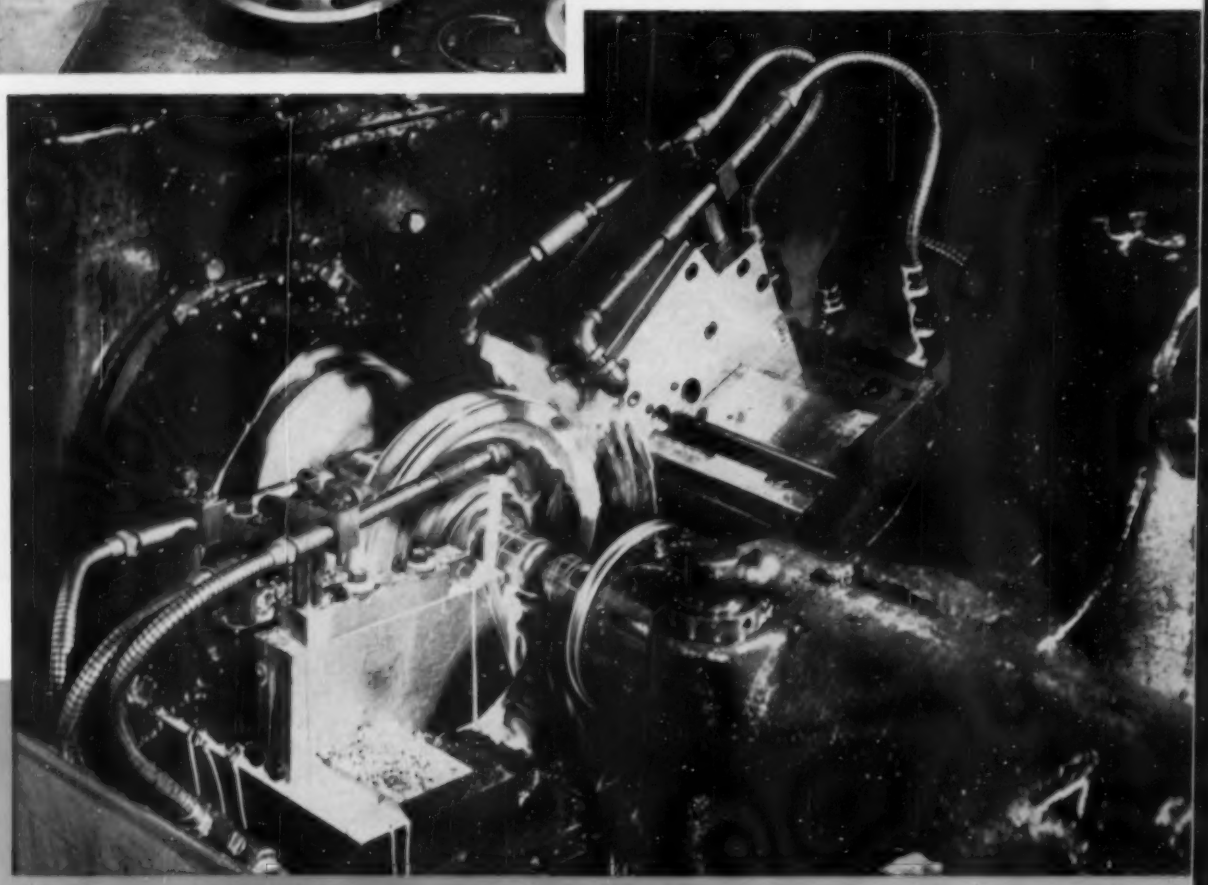
TOOLS at work



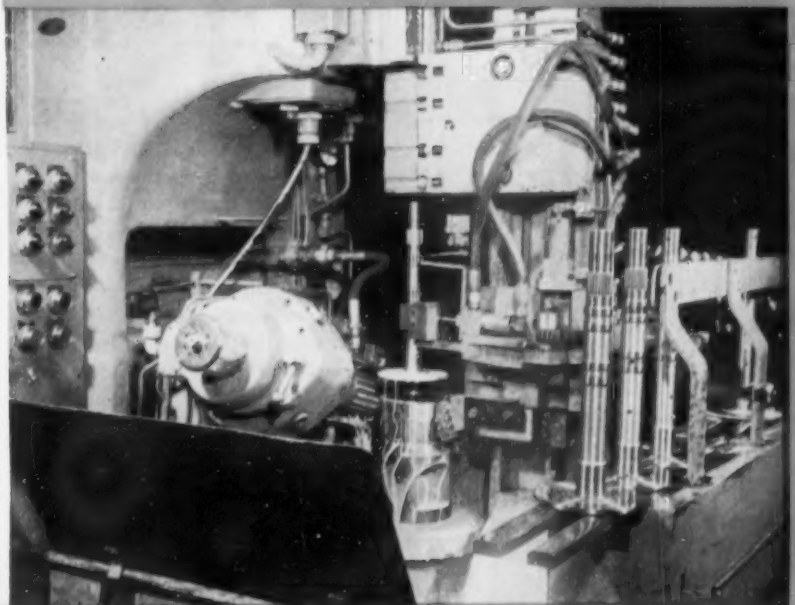
VACUUM METALLIZING of polystyrene camera flashgun reflectors at Premier Vacuum Process Corp., Maspeth, L. I. The operation produces a thin, glossy aluminum layer on the part. No further polishing or buffing is required. Special air-drying lacquers are applied as an undercoat before metallizing and as a protective topcoat afterwards. Production cycle in the Stokes vacuum chamber is 10 minutes and capacity is 1100 reflectors.

TOOLS at work

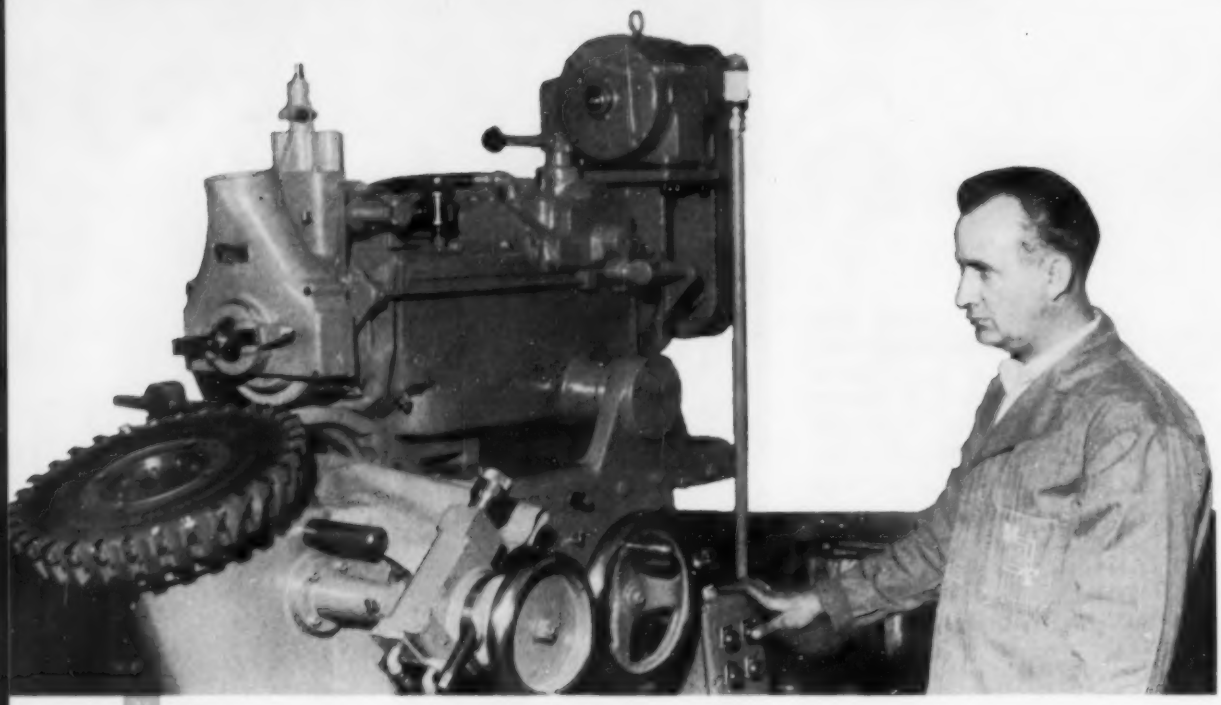
SETUP FOR PRECISION MACHINING of splined-bore gear blanks is speeded by use of pin type arbor at Frank G. Hough Co., Libertyville, Ill. As the piecepart is loaded on the Scully-Jones arbor, it is rotated to lock the pins into position. Thrust from turning keeps the piece tight. The gear blank is then machined in an automatic lathe with the square end of the arbor driven by the spindle faceplate. Blank is turned at 460 sfm, 0.010-in. feed. Carbide tools on the front slide turn the OD and face the hub. Tools on the back slide face the flange and bevel it. Production has increased by 10 to 15 percent in the new setup and operator fatigue is minimized.



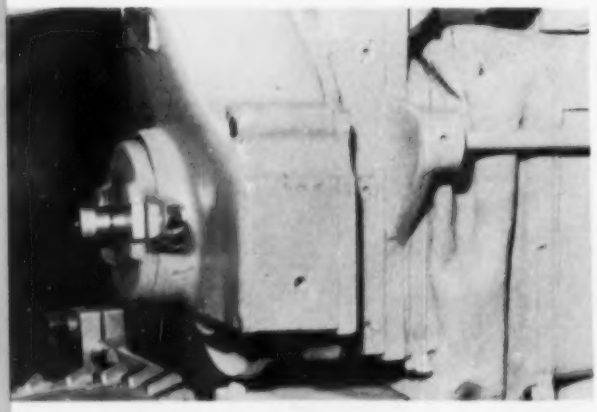
SPECIAL MACHINE TOOLS with standard components achieve economy of operation on job lots at Schlumberger Well Surveying Corp., Houston, Tex. In this machine standard drilling heads are used to make a setup for angle drilling a variety of long, narrow parts. Tooling these heads to a fabricated table simplifies the job of drilling bisecting holes at a given angle and location.

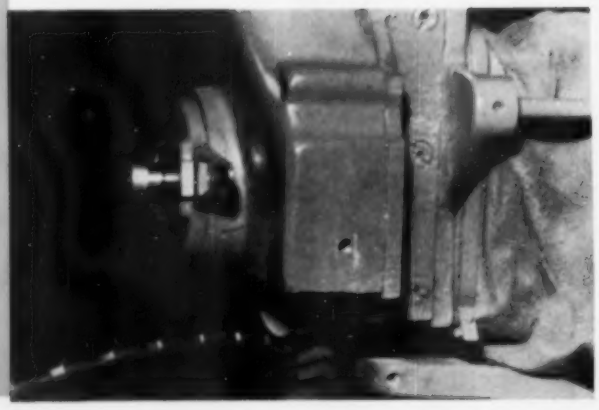


PLUNGE HOBBING TEETH on the flange of an automatic transmission shaft at the Kokomo plant of Chrysler Corp. When the operation is completed, the work-holding fixture automatically swings in a 180-deg arc to the conveyor at right for unloading of the finished part and loading of the next workpiece. Parts come down the gravity conveyor from a previous operation. The same type of transfer is used to move finished parts to the next machine.



TOOLS at work





AUTOMATIC GRINDING of carbide face mill speeds a difficult and time-consuming toolroom operation. In this arrangement, cutters are located by means of a lip rest contacting the face of the tooth which is in grinding position. The Oliver Instrument Co. machine automatically indexes after each tooth has been sharpened. Following each pass over a cutter blade the grinding wheel is automatically dressed (close-up). Grinding is done to a fixed line so that the diamond dresser controls accuracy of grind. Shape of the tooth produced is controlled by a cam. The corner angle, face and small radius on corner between face and angle are all produced in one operation. Tolerances are held to 0.0002 inch.

improved cold extrusion sequence ...reduces material and labor costs

Experimental work on cold extrusion showed that the diameter of a billet need be no larger than the diameter of the finished product. This finding makes it possible to adopt a simplified sequence of operations for the manufacture of shells and similar parts.

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Verson AllSteel Press Co.
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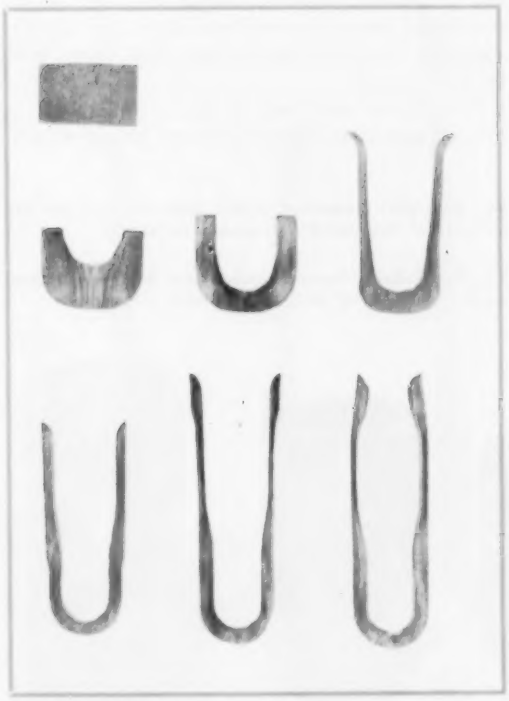


Fig. 1. Conventional method of forming shell in six operations. Flange formed on part by forward extrusion method is trimmed off prior to coining.

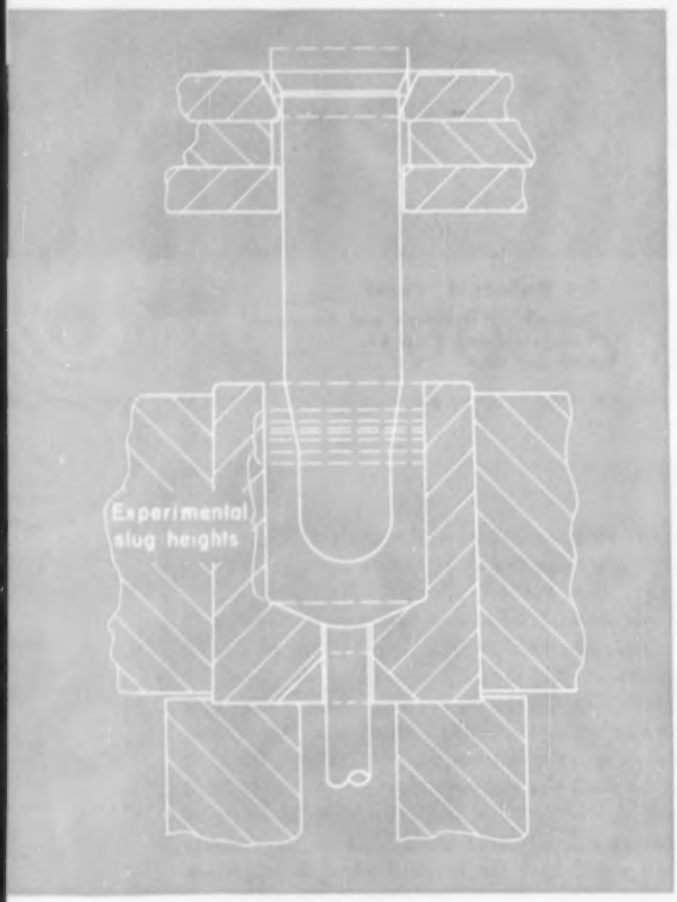
ESTABLISHED METHODS of manufacturing a product do not necessarily represent the optimum efficiency that can be achieved. Nearly 1,750,000 75mm shells, T50E2, were produced by the Gibson Refrigerator Co., using a modification of the sequence of cold forming operations developed by Heintz Mfg. Co. In the sequence used at Gibson, a four-inch diameter billet or slug was formed into a shell in six operations, *Fig.* 1. The final diameter of the shell was less than three inches. This large reduction in diameter was considered necessary to provide sufficient cold working to insure that the shell would have the required physical properties.

At the time mass production of shells was started at Gibson, scrap losses were high and many difficulties were encountered in production. It was suggested that reducing the billet diameter would facilitate forming and lead to economies in manufacture. Since metal would not have to be moved so far in forming the smaller-diameter billet, the sizing operation could be eliminated and the forward extrusion operation could be replaced by a second backward extrusion operation. Whether or not this sequence of operations would give the required physical properties in the finished shell was unknown.

The suggestion was not put to test immediately because it was felt that the cost of applying the

Table 1—Data on Backward Extrusion of 3¼-Inch Diameter Billets

Billet No.	Length (inches)	Pressure (tons)	Base Thickness (inches)
1	3.125	270	2.625
2	3.25	270	1.625
3	3.50	330	2.625
4	3.75	330	2.625
5	3.875	460	2.0
6	3.625	400	2.0
7	3.875	540	2.0



change to production might not be fully recovered before the end of the contract. Tests made at a later date, however, showed that the physical properties of shells made from smaller-diameter billets were satisfactory and that the proposed production method would give good results.

To make the experiments, a worn-out coining bushing and a broken punch were adapted for the backward extrusion of 3¼-inch diameter billets, *Fig.* 2. Seven billets were prepared by turning down a length of 4-inch diameter shell-quality stock. Billet length ranged from 3⅛ to 3⅞ inches. All billets were given a standard phosphate-and-soap coating prior to extrusion operations. The make-shift die and punch were press-fitted into the coining die-shrink ring assembly used for production. Backward extrusion operations were accomplished in a 600-ton coining press. The tests showed that extrusion pressures increase with increasing length (volume) of billets, TABLE 1.

After process annealing and surface coating, Part 5 and Part 7 each underwent an additional operation to reduce the base thickness to one inch. Part 5 was back-extruded further in the same die, with the press ram lowered to reduce the base thickness of the part. Pressure of 515 tons was required to reduce the base thickness to one inch.

Contours of Part 5 after the second backward extrusion conformed closely to those of parts coming from forward extrusion operation in the standard production sequence, except that Part 5 did not have a flange or press rest, *Fig.* 3. In the conventional manufacturing process, this flange must be trimmed off.

Part 7 was subjected to the usual production coining operation, with a backward extrusion pres-

Fig. 2. (left) Reworked punch and die used for experimental backward extrusion operations.

Fig. 3. (below) Some experimental backward extrusions. Absence of flange eliminates trimming.

sure of 300 tons, to reduce base thickness to one inch. Results of the test indicated that with 3¼-inch diameter billets, it was possible to replace sizing, backward extrusion and forward extrusion operations—the first three operations in the conventional method of forming shells—with two backward extrusion operations. Moreover, tensile test specimens taken from Part 7 showed that shells produced by the new sequence of operations, *Fig.* 4, had physical properties which were well within Ordnance specifications, TABLE 2.

Unfortunately, the shell contract at Gibson was terminated before the new sequence of operations could be adopted. Calculations showed, however, that large savings in material, press time and direct labor would have resulted in production. Due to the reduced billet diameter, for instance, material loss from cutting bar stock into billets would have been reduced from 0.89 to 0.58 lb per shell. Elimination of the flange produced by the forward ex-

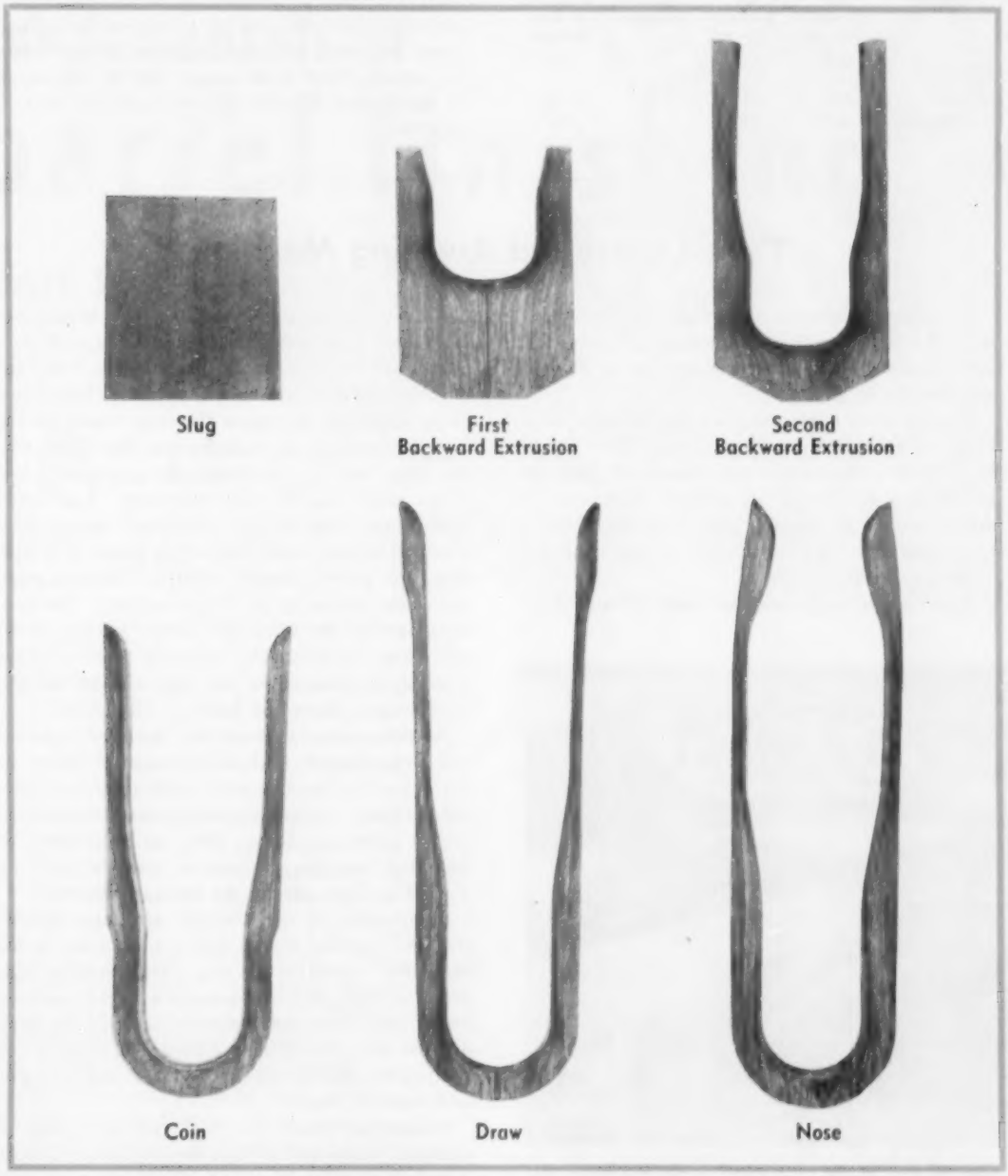


Fig. 4. Two backward extrusion operations replace three operations necessary in conventional manufacture of shells. There is no flange on part after second backward extrusion.

trusion operation would have eliminated a trimming operation and resulted in an average material savings of approximately 0.28 lb per shell.

One 1500-ton press operation would have been eliminated, as well as one cycle of surface-coating operations. The other two 1500-ton presses used in the existing production method could have been replaced by one 1000-ton and one 800-ton press to perform the two backward extrusion steps of the new sequence of operations. On the basis of time-study estimates, over-all labor requirements for the new method would have been 10 percent less than for the conventional method.

Table 2—Physical Properties of Experimental Shell

Properties	Yield Strength (1000 psi)	Ult. Strength (1000 psi)	Elongation (percent)	Reduction of Area (percent)
Required by Ordnance	85.0	—	12	25
As Coined	97.6	102.0	10	34
Stress Relieved	94.0	98.0	14	50

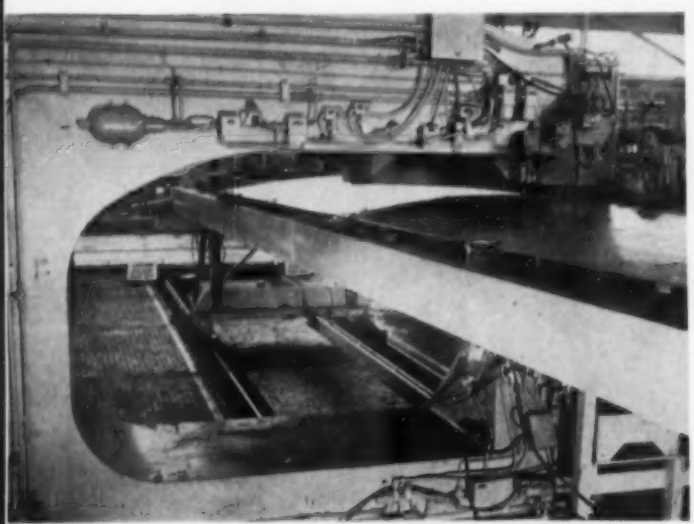
It follows that in the cold forming of any parts which lend themselves to this method of manufacture, the diameter of the billet need be no larger than the outside diameter of the finished product, provided that the amount of cold working accomplished during forming is sufficient to produce the desired physical properties. In cases where physical properties are obtained by subsequent heat treatment, or where physical properties are of minor importance, there is no reason why the advantages of using small-diameter billets should not be fully exploited.

Tape-Controlled Riveting Machine

To assure a tightness that would allow the wing itself of a multijet seaplane to be used as a secondary fuel container, automation was adapted to drilling and riveting at Martin.

Feature of the operation is the special rivets used. Made of straight rods of aluminum alloy cut to length with ends squared and chamfered, they are heat-treated and stored at —20 F. They must be driven within 20 minutes after exposure to room temperature or they will begin to age and are unsatisfactory for driving.

A special Drivmatic machine automatically drills and rivets the stringers to the 10 x 37-ft wing panel. No sealant is needed in the process. The work-piece is clamped in position; the machine then drills and countersinks the rivet hole, injects the chilled slug rivet, upsets the bottom of the slug, upsets the top into the countersink, mills the top head flush with the wing surface, unclamps the workpiece, and resets itself for the next sequence. The entire operation is controlled by a coded hole pattern on a standard 35-mm movie film which serves as a tape. The tape passes beneath electrical contacts regulating the functions of the equipment. The contacts translate the holes into electric signals. Holes in the tape are located by manually positioning the assembly in relation to the tape and by using a hand tool to pierce the holes.



Closeup view of the wing panel in the Drivmatic machine. Speed of riveting and drilling operations is seven times faster than when hand riveting is used.

As the rivets are used, they are first squeezed and then vibrated. Both of these operations can be performed by the Drivmatic, although more electrical settings are required with automatically controlled vibrating. Rivets then can be inserted in restricted insertion spaces, the machine applying a 1500-lb clamp during the riveting process.

Components of the machine are supported or enclosed in a steel frame. Lower ram of this frame heads the bottom of the slug rivet, provides high pressure clamp, and incorporates a special profiling mechanism which automatically controls the edge distance along the stringer. Upper head of the frame contains the drill spindle, mill spindle and rivet gun with injector fingers.

A handling frame, to which the wing panel is attached, guides and delivers the workpiece to exact drill and rivet location, and can move in vertical, transverse, longitudinal and radial planes.

Tool Engineering

REPORT

fundamentals of barrel finishing

part two—how to get started

By T. W. Black
Associate Editor

Barrel-finishing methods are being successfully applied in many modern plants. In others, lack of knowledge has prevented management from exploiting this avenue to reduced manufacturing costs. This portion of a two-part article is intended to aid tool engineers in planning for the installation of barrel finishing.

IN MANY EFFICIENT plants, barrel finishing represents one of the few remaining feasible means of reducing manufacturing costs. Other means of cost reduction, such as the use of automatic machines and automatic conveying of parts between successive production operations, may be fully exploited. Often, however, automatic machining or stamping operations are followed by manual deburring and polishing or other hand-finishing operations. The direct-labor cost of performing these operations on a complex part may well exceed the direct-labor cost of all of the previous stamping or machining operations. Thus cost-minded tool engineers often find it profitable to investigate the possibilities of barrel finishing applications in their plants.

Some of the operations which can be replaced by barrel-finishing methods are:

1. Deflashing, deburring, descaling or breaking sharp corners by hand filing, wire brushing, abrasive-belt grinding or wheel grinding
2. Polishing on a buffing wheel or special polishing machine
3. Generating radii on corners by hand filing or with a grinding wheel
4. Chamfering holes in a drill press or other machine.

A survey will generally disclose a number of such operations in any plant.

If the operating personnel of a plant are unfamiliar with barrel-finishing operations, there is often a good deal of skepticism concerning possible applications, particularly where the parts in question

are made to high standards of precision or if nicking of parts might be a problem. The best answer to such skepticism is to try out barrel-finishing methods on sample parts, *Fig.* 1.

The owner of one custom barrel-finishing shop recently had an experience which indicates the extremes of skepticism and faith that are encountered when barrel-finishing operations are being considered. He was asked to polish one hundred silver dollars which were to be used in a silver anniversary celebration. The customer was greatly concerned about possible nicking or other damage, and insisted that the finishing cycle be stopped every few minutes so that he could inspect the dollars. His opinion of barrel finishing methods was considerably higher when it was demonstrated that no damage occurred. He was then shown a load of parts which were being finished in an adjoining barrel. The load consisted of ten experimental titanium aircraft parts, each of which was valued at $2900. These were being finished to generate a precision radius. The aircraft parts manufacturer regularly sent in such parts with complete confidence that they would not be damaged in the barrel. A wide range of parts are being successfully barrel finished by many manufacturers. Some typical parts are shown in *Figs.* 2, 3, 4, and 5.

Setting Up a Barrel-Finishing Job: Once a decision has been made to try out barrel finishing on selected parts, the question of how to get started arises. One solution is to purchase a small barrel and quantities of various types of media and compounds, and make test runs until satisfactory barrel-finishing processes are determined. Another solution is to utilize the experimental finishing services offered by manufacturers of barrel-finishing equipment and supplies. Most such manufacturers maintain laboratories specifically for the purpose of experimental work. When furnished with a group of sample parts, laboratory personnel can quickly determine whether or not the parts can be successfully barrel finished, and can make specific recommendations as to the equipment and type of process needed.

After installation of several successful barrel-finishing operations, it may be decided to set up facilities for experimental work in the plant, rather than rely on the services of an outside laboratory. It has been found that the key to successful experimental work is to assign an intelligent and imaginative engineer to the job on a full-time and permanent basis. If no experienced personnel are available, they can be trained on the job. Several manufacturers of barrel-finishing equipment and

Photo courtesy The Carborundum Co.

Fig. 1. (above) Multiple-barrel machines are well-suited to running small lots of parts on an experimental basis. Operation shown is at Remington Rand, Inc., Elmira, N. Y.

Photo courtesy Norton Co.

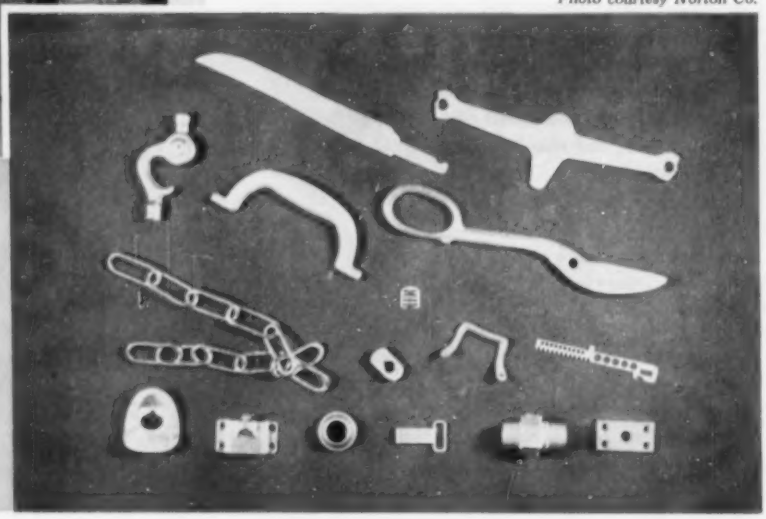


Fig. 2. (right) Typical hardware parts after barrel finishing.

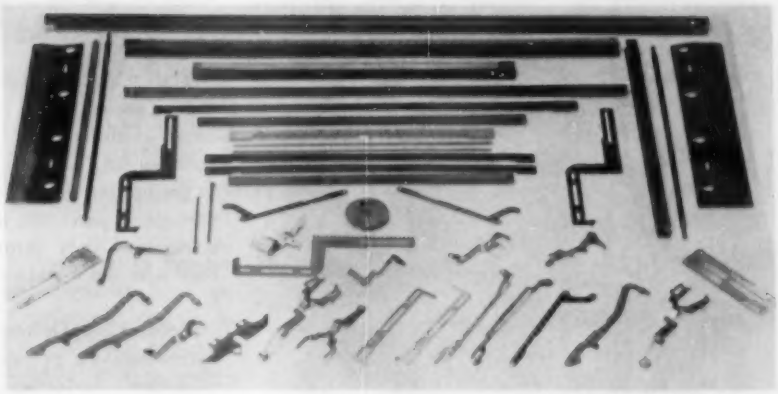


Fig. 3. Stamped and machined business machine parts after deburring and polishing operations.

Photo courtesy BMT Mfg. Corp.

supplies maintain customer training programs, and their experimental facilities can be visited by plant personnel at any time. The barrel-finishing engineer should also be encouraged to visit other plants where barrel-finishing operations are performed so he will be able to profit by the experience of others.

Barrel-Finishing Variables: Many variables must be considered by the barrel-finishing engineer in planning for new operations. A complete discussion of these finishing variables is contained in Part One of this article. A summary of these variables follows, as a quick reference in planning.

TYPE OF BARREL: The size and type of barrel used depends, of course, on the size and quantities of workpieces to be finished and, to some extent, on their shape. Open-end tilting barrels are sometimes suitable for relatively small quantities of parts. Somewhat larger quantities of parts can be accommodated in a bottle-shaped barrel, which is considered more efficient than an open-end tilting barrel because work can be done with the barrel in a horizontal position. Closed horizontal barrels are the most frequent choice for precision finishing. Multicompartment barrels make it possible to finish several lots of parts simultaneously, or to individually finish large parts. Multi-barrel machines have the same advantage, plus an end-to-end action which facilitates finishing long parts. End-loading barrels are also adapted to finishing long parts and, because of their construction, wedging of parts between the door and the wall of the barrel is not a problem. Triple-action barrels are a good choice for general-purpose work. They are also used for parts which tend to stick to the walls of conventional horizontal barrels. Perforated barrels, which are immersed in separate tanks for successive finishing operations, permit savings in compounds and abrasives, and lend themselves to automatic handling.

It should be pointed out that for finishing heavy workpieces or large loads, or when heavy media such as steel balls are used, barrels should be constructed to withstand the weights involved. Barrel loads of 1000 to 2000 pounds are not uncommon.

MEDIA SELECTION: Media include metal shapes, aluminum oxide and natural stones in random shapes, abrasive grit and bonded shapes, plus wood and rubber shapes for special purposes. Aluminum-oxide stones are the most widely used media. Fastest cutting is accomplished by the larger sizes; smaller sizes give better finishes. Metal shapes are widely used for burnishing. Hardened and unhardened steel and zinc shapes, used in conjunction with an abrasive grit, provide a means for carrying abrasives into recesses and holes in the workpiece, as well as adding weight to barrel loads for faster action. Bonded triangles and other bonded shapes give a faster cutting action than other media, and their definite shape and size is advantageous where lodging and wedging of media in parts is a problem. Irrespective of the type of media employed, it should be either too large or too small to wedge in holes or recesses in parts.

COMPOUNDS: Acid compounds are used for descaling heat-treated parts. Alkaline compounds neutralize acid compounds, prevent rusting and preserve color of ferrous workpieces. Neutral compounds act as cleaning and sudsing agents for all types of workpieces and are the best choice for most uses. Hard water may cause pitting or corrosion of some materials, so water hardness should be checked and a softener added if necessary. Some compounds contain a softener. Cutting compounds

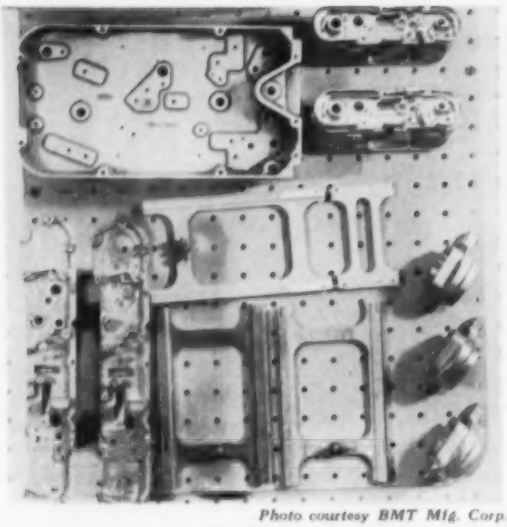


Photo courtesy BMT Mfg. Corp.

Fig. 4. Camera bodies and other camera components barrel finished at Graflex, Inc., Rochester, N. Y.

contain abrasive grains, saving a separate measuring operation outside the barrel. They are available in acid, alkaline and neutral formulations.

WATER LOADS: Water exerts a desirable cushioning effect on the load in a barrel; however, too much water will retard the barrel finishing action unduly. Lower water levels promote the finishing action. When the level is extremely low, abraded particles will accumulate on parts and media, inhibiting the finishing action. When setting up a job, it is best to have the water level just cover the top of the load. For the majority of barrel finishing operations, the optimum water level will be within a few inches of this point.

RATIO OF PARTS TO MEDIA: A 1:3 ratio of parts to media is a good starting point. If nicking or other damage to parts occurs with this ratio, the ratio may be decreased to as low as 1:6 or 1:7.

LOAD HEIGHT: With horizontal barrels, the longest sliding action, hence the greatest amount of finishing action, occurs when the barrel is half full. Smaller work loads mean that the capacity of the barrel is not being used efficiently and the finishing action is slowed down. Larger work loads also reduce the efficiency of the finishing action, but may be desirable to cushion delicate workpieces.

ROTATIONAL SPEED: Normal speeds of rotation with a 30-inch-diameter barrel will run between 6 and 30 rpm for most jobs. With smaller barrels, speeds range from 26 to 35 rpm.

TIME CYCLES: Most barrel finishing operations can be accomplished in from one to six hours. Because of differences in part configurations, materials, media and type of operations, it is impossible to predict the length of time required for finishing any given part; the length of time cycles can be determined only through experiment and experience with the workpiece involved.

Protecting Delicate Parts: When developing barrel-finishing processes, protection of parts is an important consideration. When there is a definite possibility of part-on-part impingement, nicking or bending of fragile parts, careful barrel loading and the use of media often can prevent damage. Parts can be loaded in layers, and about 10 percent of the media used can be of much larger size than is required for finishing, to aid in keeping the parts separated. Maintaining an exceptionally high work-load level, in extreme cases filling the barrel nearly to the top, will greatly reduce the sliding action, as will the use of low barrel speeds. High water levels, too, will exert a cushioning effect. Large rubber or wood blocks, *Fig.* 6, also are effective in preventing parts from striking each other during the finishing cycle.

Where these precautions are not effective, or increase the length of the finishing cycle unduly, the

Photo courtesy Lord Chemical Corp.

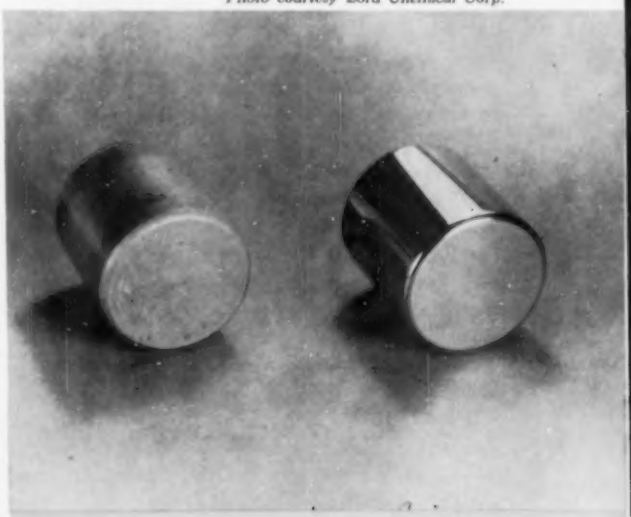


Fig. 5. Carbon-steel roller bearing before and after polishing in a barrel.

use of fixtures to hold workpieces in place in the barrel is advisable, *Fig.* 7. This makes it possible to use normal work loads, water levels and speeds. In order to make sure that both sides of the workpieces are finished uniformly, it is necessary to reverse the direction of rotation of the barrel at the halfway point in the finishing cycle.

Record Keeping: As in any type of developmental work, the importance of keeping good records of barrel-finishing experiments cannot be overemphasized. A typical test sheet is shown as *Fig.* 8. As records accumulate, they furnish a wealth of valuable information for setting up new jobs. After a successful finishing method has been established in the laboratory, a process sheet, *Fig.* 9, should be written up. The instructions on the process sheet should be followed exactly in production. Normally, the same finishing results should be obtained as in the laboratory. The barrel-finishing engineer should follow through on each job to make sure that the process developed is being used and that satisfactory results are being obtained.

Sometimes a considerable amount of detective work is required to determine why laboratory results are not duplicated in production. In one plant where barrel finishing methods are extensively employed, large quantities of parts were rejected because of nicks and, as a result, barrel-finishing of these parts was discontinued. Extensive trials in the laboratory showed that the barrel-finishing process used did not cause nicking. The engineer assigned to barrel-finishing development then followed a group of parts through all steps in the production process. He discovered that the nicks resulted when the parts were dropped six feet from one conveyor to another for processes performed subsequent to the barrel-finishing operation. Installation of an inclined chute solved the problem.

Number of Operations: The number of finishing cycles required for the barrel finishing of a specific part will, of course, depend on the nature of the operations performed. A typical part might require removal of heavy scale, deburring and polishing. Different media, compounds and time cycles might be required for each of these operations. Accordingly, parts would be run through three separate cycles. If only descaling were required, one finishing cycle would be adequate. The number of operations required is best determined by experiment.

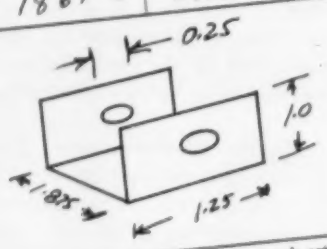
The Production Setup: Rather elaborate production setups may be required where product

Photo courtesy Lord Chemical Corp.

Fig. 6. Wood blocks prevent heavy castings from striking against each other during barrel finishing operations.

Fig. 7. Fixture used to hold gold-plated spectacle frames in position during polishing operation at the experimental laboratory at BMT Mfg. Corp.

Barrel Finishing Test Sheet

Part number: 1867-C	Part name: Mounting bracket	Test no.: 3
Sketch: 		Material: 1025CR-11ga.
		Operation: Remove light burr Break sharp corners and edges
Media: No. 2 aluminum oxide	Media-to-work ratio: 3:1	Parts per load: 200
Water level: 3" below load	Work load level: 50%	Barrel type: 30" octagonal
Compound: neutral	Amount of compound: 2 oz.	RPM: 76

Test Results

Time (minutes)	Comments
60	Insufficient burr removal
120	Adequate burr removal - corners and radii still sharp
180	Parts satisfactory

Recommendations: Process as above with 180-minute finishing cycle. Rinse thoroughly and dry in clean sawdust in open-end tilting barrel.

Test by: Carpenter | Requested by: A. Jones - Tool Eng. Dept. | Date completed: 4-9-57

Fig. 8. Barrel-finishing test sheet provides an accurate record of development work.

volumes are high. Where production volumes are small, a barrel-finishing department may consist of one barrel and a part-time operator who loads the barrel manually, and segregates parts and media manually after the finishing cycle is completed. For larger installations, loading may be expedited with hoist pans, *Fig.* 10, and separation of media accomplished by mechanical or magnetic separators, *Fig.* 11.

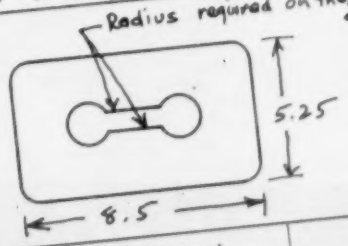
Whatever the size of the installation, provision for adequate means for cleaning and drying parts is essential. Dirt and oil on parts or media may contaminate finishing compounds and will often inhibit the desired abrading action. While parts may be cleaned in a barrel, it is better to clean them before they enter the barrel in order to avoid

possible contamination of media and the barrel itself. This can best be accomplished in a separate cleaning tank. Once the parts are in the barrel, they should be thoroughly rinsed between successive finishing operations. Perforated compartment doors greatly facilitate barrel draining.

Where finished parts are to be stored for subsequent operations or packed for shipment, thorough drying or use of a rust inhibitor is mandatory. Use of a wetting agent as a final rinse promotes good drainage from parts. In many plants, the final operation is a hot-water rinse, intended to raise the temperature of the parts and encourage rapid evaporation of water. Tumbling in sawdust or corncob meal dries parts effectively but, of course, these materials cannot be used where there is a

Barrel Finishing Process Sheet

Part number: 8993-A	Part name: Iris blank	Material: 1/16" Brass

Sketch: 

Operation:
Remove all burrs
Generate radii on sharp edges
Polish

	Operation 1	Operation 2	Operation 3
Step	Grind	Polish	Dry
Barrel type	24 x 30 inch lined octagonal barrel	Same	Open-end barrel
RPM	12	12	
Media type	No. 3 natural stones	Same	Hardwood sawdust
Work load height	3/4 full barrel	Same	
Compound (type)	neutral	non-ferrous polishing compound	
Compound (amount)	2 lb.	2 lb.	
Water level	Just over mass	Same	
No. parts per load	1 no	100	
Cycle time	6 hrs	1 hr.	
Special instructions:	Rinse well	Separate while unloading	

Remarks: After operation 2, dip in cold water to rinse, then dip in hot water

Process Engineer:	Date:
Jones	3-15-57

Fig. 9. Barrel-finishing process sheet should accompany each job and should be followed exactly by operator.

possibility of blocking holes in parts. Spin dryers, hot-air blowers and infrared drying units are all frequently used in plants where large quantities of parts are processed.

Experiment—and experience—are the best guides to successful application of barrel-finishing methods. Potential applications exist wherever hand-finishing operations are extensively employed. Replacing these operations with barrel-finishing operations represents one of the last major frontiers of manufacturing cost reduction.

Acknowledgments

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Casalbi Co. .....Jackson, Mich.
Lord Chemical Corp.....York, Pa.
Norton Co. .....Worcester, Mass.
Tumb-L-Matic, Inc.....New York, N. Y.
Westinghouse Electric Corp.....Pittsburgh, Pa.
The Carborundum Co.....Niagara Falls, N. Y.

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Photo courtesy The Carborundum Co.

Fig. 10. (above) Media and parts are premixed in tote pan at Remington Rand, Inc.

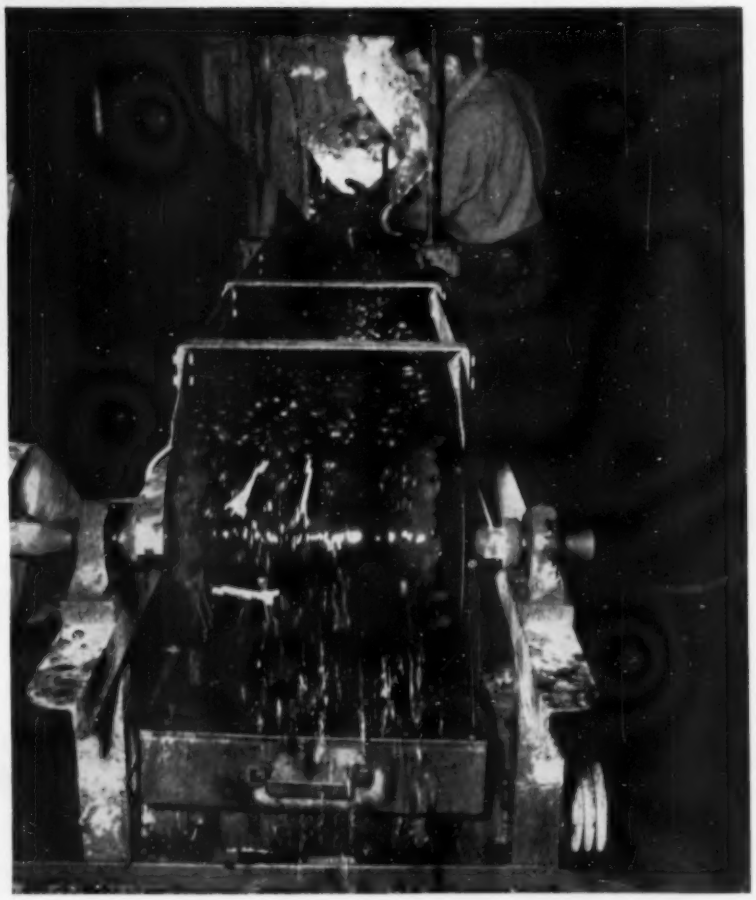

Fig. 11. (right) Magnetic separator at Remington Rand plant. Media fall into tote pan; parts into box beneath conveyor.

Photo courtesy The Carborundum Co.

Converting All-Directional tolerances to Orthographic Form

By Allen M. Johnson*
President
Oak Knoll Engineering Service
Springfield, Mass.

SPECIFICATION of hole locations by basic dimensioning is coming into widespread use. With this method, the application of locational tolerances is accomplished by specifying that holes are to be located within a tolerance circle of given diameter, *Fig.* 1.

Basic dimensioning is desirable because it simplifies the task of preparing drawings and allows an inspector to apply the permissible tolerance in any direction. It also provides a greater tolerance area than is possible with orthographic (perpendicular) tolerances, with equal functional accuracy.

Operators of jig borers and jig grinders, however, must work to tolerances applied in the two transverse directions in which machine adjustments can be made. These tolerances are usually given as at *B* and *C*, *Fig.* 2. Working tolerance limits are calculated by multiplying the radius of the tolerance circle by the sine of 45 deg. When these limits are applied, positively and negatively, to the basic dimensions, the resulting tolerance area

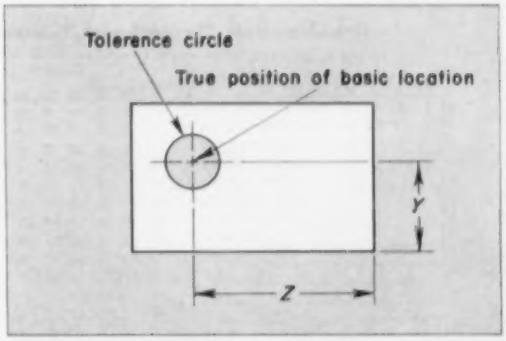

Fig. 1. Part with hole located by basic dimensions, shown as *Y* and *Z*.

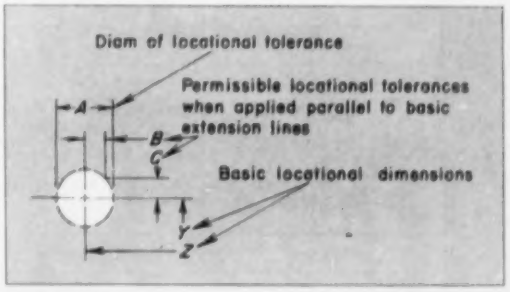

Fig. 2. Enlarged view of diameter of all-directional tolerance.

*Senior member ASTE Springfield chapter.

REFERENCE SHEET

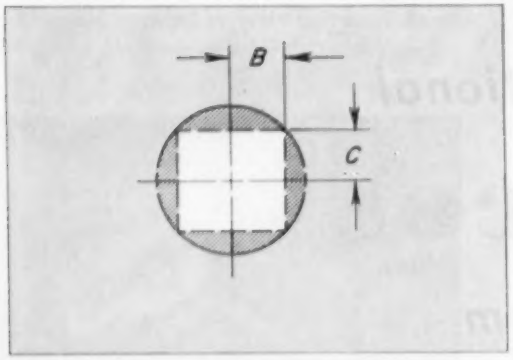

Fig. 3. Conventional method of applying equal tolerances decreases area of locational tolerance by 36 percent (shaded area).

takes the form of a square inscribed within the tolerance circle, *Fig.* 3. The area of the square is approximately 36 percent smaller than the area of the circle.

When working drawings showing only these reduced tolerances are supplied to an operator and an inspector, the inspector would normally reject a part with a hole located within the shaded area shown in *Fig.* 3, even though the hole is located within the tolerance area specified on the parent drawing.

This can be avoided by using the accompanying table, which provides both the operator and the inspector with a full range of orthographic tolerances for any given tolerance circle. For example, if a tolerance circle of 0.002-inch diameter is specified and a hole is found to be 0.0003 inch from basic location in one direction, the table shows that the permissible error in the transverse direction is plus or minus 0.00095 inch, one-third more than if conventional tolerancing methods were used. The table includes complementary orthographic tolerances for tolerance circles with diameters as large as 0.014-inch, thus covering virtually all situations where such tolerancing methods are applicable.

Complementary Perpendicular Tolerances for Given Diameters of Tolerance Area

Diameter of Tolerance Circle

Measured Deviation from True Position of Basic Location	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	44	48	52	56	60	64	68	72	76	80	90	100	110	120	130	140
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	22	24	26	28	30	32	34	36	38	40	45	50	55	60	65	70
1	0	1.7	2.8	3.9	4.9	5.9	6.9	7.9	8.9	9.9	11	12	13	14	15	16	17	18	19	20	22	24	26	28	30	32	34	36	38	40	45	50	55	60	65	70
2		0	2.2	3.5	4.6	5.7	6.7	7.7	8.8	9.8	11	12	13	14	15	16	17	18	19	20	22	24	26	28	30	32	34	36	38	40	45	50	55	60	65	70
3			0	2.6	4	5.2	6.3	7.4	8.5	9.5	11	12	13	14	15	16	17	18	19	20	22	24	26	28	30	32	34	36	38	40	45	50	55	60	65	70
4				0	3	4.5	5.7	6.9	8.1	9.2	10	11	12	13	14	15	17	18	19	20	22	24	26	28	30	32	34	36	38	40	45	50	55	60	65	70
5					0	3.3	4.9	6.2	7.5	8.7	9.8	11	12	13	14	15	16	17	18	19	21	23	26	28	30	32	34	36	38	40	45	50	55	60	65	70
6						0	3.6	5.3	6.7	8	9.2	10	12	13	14	15	16	17	18	19	21	23	25	27	29	31	33	35	38	40	45	50	55	60	65	70
7							0	3.9	5.7	7.1	8.5	9.7	11	12	13	14	15	17	18	19	21	23	25	27	29	31	33	35	37	39	44	50	55	60	65	70
8								0	4.1	6	7.5	8.9	10	11	13	14	15	16	17	18	20	23	25	27	29	31	33	35	37	39	44	49	54	59	65	70
9									0	4.4	6.3	7.9	9.4	11	12	13	14	16	17	18	20	22	24	27	29	31	33	35	37	39	44	49	54	59	64	69
10										0	4.6	6.6	8.3	9.8	11	12	14	15	16	17	20	22	24	26	28	30	32	35	37	39	44	49	54	59	64	69
11											0	4.8	6.9	8.7	10	12	13	14	15	17	19	21	24	26	28	30	32	34	36	38	44	49	54	59	64	69
12												0	5	7.2	9	11	12	13	15	16	18	21	23	25	27	30	32	34	36	38	43	49	54	59	64	69
13													0	5.2	7.5	9.3	11	12	14	15	18	20	23	25	27	29	31	34	36	38	43	48	53	59	64	69
14														0	5.4	7.7	9.6	11	13	14	17	19	22	24	27	29	31	33	35	37	43	48	53	58	63	68
15															0	5.6	8	9.9	12	13	16	19	21	24	26	28	31	33	35	37	42	48	53	58	63	68
16																0	5.7	8.2	10	12	15	18	20	23	26	28	30	32	34	37	42	47	53	58	63	68
17																	0	5.9	8.5	11	14	17	20	22	25	27	29	32	34	36	42	47	52	58	63	68
18																		0	6.1	8.7	13	16	19	21	24	26	29	31	33	36	41	47	52	57	62	68
19																			0	8.2	11	15	18	21	23	25	28	31	33	35	41	46	52	57	62	67
20																				0	9.2	13	17	20	22	25	27	30	32	35	41	46	51	57	62	67
22																					0	9.6	14	17	20	23	26	28	31	33	39	45	50	56	61	66
24																						0	10	14	18	21	24	27	29	32	38	44	49	55	60	66
26																							0	11	15	19	22	25	28	30	37	43	48	54	60	65
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55																																	0	24	35	43
60																																		0	25	36
65																																			0	26
70																																				0

All figures are in ten-thousandths of an inch

Tolerance values smaller than 10 are accurate within 4.9 millionths of an inch

Tolerance values greater than 10 are accurate within 49 millionths of an inch

tools

Wherever temple spires arise,
Wherever children trudge to schools,
Always before their watchful eyes,
Is seen man's handiwork with tools.
All that of beauty greets the eye,
The streets, the churches and the schools,
Announces to the passer-by,
All things of earth are made with tools.

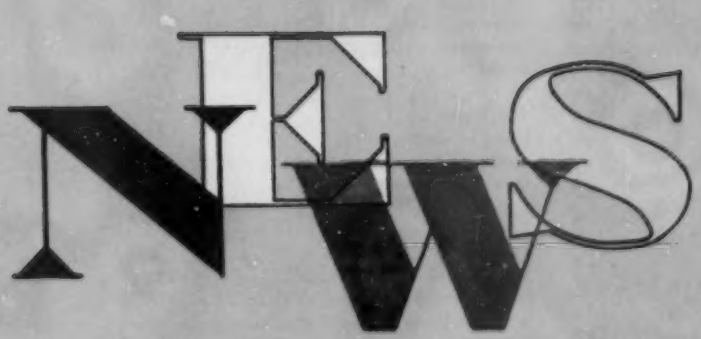
The world would still a jungle be,
Had man not fashioned tools to aid.
No ship today would sail the sea
Without the tools which man has made.
That extra strength all men require;
The distant goal they seek to gain;
Is profit of the ore and fire
Which give to them both ship and plane.

With tools the busy streets were paved.
With tools the spires of temples rise.
Without them nothing could be saved,
The wisest men would not be wise.
With tools men stronger grow to be.
With tools both train and vessel run
In sky, on earth and land and sea
With tools the work of life is done.

by Edgar A. Guest

Especially composed for
the American Society of Tool Engineers
Silver Anniversary

aste



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Harold E. Collins

President, 1957-58

Mr. Collins, elected at the 25th Annual Meeting to the highest office in ASTE, is the 26th president of the Society and the new chairman of the Board of Directors.

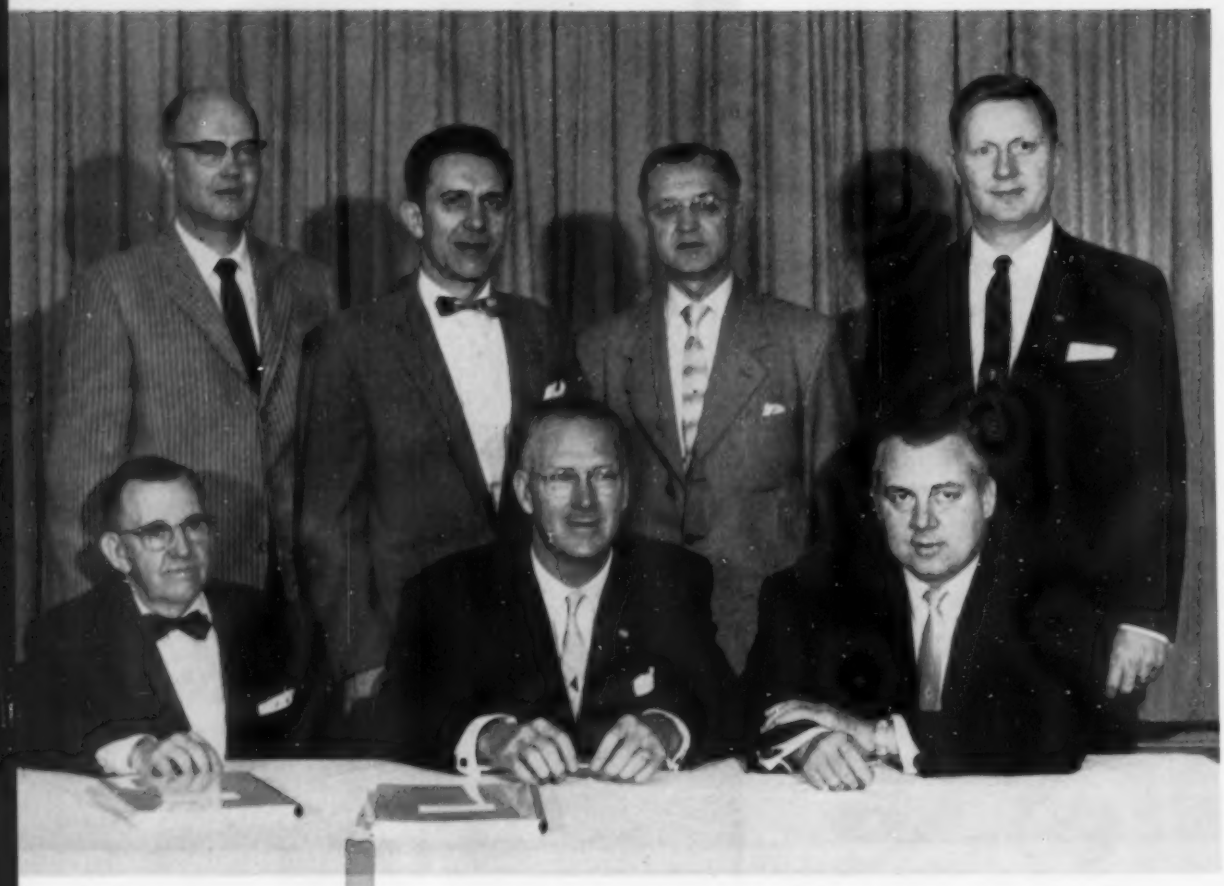
Manager of foreign operations for Hughes Tool Co., Houston, Texas, Mr. Collins is also a director of Hughes Tool Co., Ltd., in Belfast, North Ireland.

Now in his tenth term on the Board of Directors, Mr. Collins' former national offices include those of treasurer, and third, second and first vice president of ASTE. He is a charter member and past chairman of the Houston chapter.

Mr. Collins is a member of the Institute of Production Engineers, England, and Verein Deutscher Ingenieure, Germany. He is associated with the American Society for Metals and the Army Ordnance Association.

Mr. Collins has served as a consultant on machine tools to the Commerce Department, Washington, D. C., and has spoken before many groups on the subject of machines and tooling methods of present-day Europe. He taught supervisory classes under the Houston School of Technology and the War Production Board.

Included among his many Society activities is the assistance he gave in chartering the following chapters: Tulsa, Memphis, North Texas, Madison, San Antonio, Long Island, Little Rock, Oklahoma City, East Texas, New Orleans, Mississippi and the student chapter at Atlanta, Georgia.



Society Officers 1957-58

New leaders of ASTE, elected by the Board of Directors to serve as officers for the year 1957-58, are shown after their election on Monday, March 25 at the Silver Anniversary Convention in Houston. Seated are George A. Goodwin, first vice president; Harold E. Collins, president; and Wayne Ewing, second vice president. Standing: William Moreland, fourth vice president; H. Dale Long, third vice president; John X. Ryneska, treasurer; and David Schrom, secretary.

1957 CONVENTION Marks 25 Years of Progress

ASTE's new president, Harold E. Collins, salutes twenty-five years of Society progress at the Silver Anniversary Celebration on Monday, March 25.

Show Schedule Revised

Everything was Texas "Big" at the American Society of Tool Engineers' gala Silver Anniversary celebration in Houston from March 23-28.

At the annual meeting of the ASTE Board of Directors, announcement of a revised exposition schedule was made. Philadelphia is to be the site of the next exposition in 1958, and commencing in 1960, Detroit will be the biennial host to the tool show with Chicago and Philadelphia being hosts in alternate years. A West Coast exposition is to be held in the fall of every other year beginning in 1958.

These tooling shows will provide an unparalleled exposition program among technical societies, exhibiting the latest developments in tooling, machines, processes and methods.

The Board of Directors elected by the delegates in a closed meeting Sunday, March 24 are shown here. Seated are H. Dale Long, Howard C. McMillen, Harold E. Collins, Wayne Ewing, and George Goodwin. Standing are John X. Ryneska, William A. Thomas, Philip Marsilius, Irving H. Buck, Joseph L. Petz, Leslie C. Seager, Gustave B. Berlien, and Charles Smillie. Frank F. Ford and Edmund Hollingsworth, also elected, were unable to be present at the time this photograph was taken.

1957 CONVENTION

An hour-long closed circuit audio broadcast, the largest ever to be attempted, emanated from Houston as part of the Anniversary Banquet program and was heard simultaneously by 143 ASTE chapters across the nation and in Canada.

Participating in the closed circuit broadcast were some of the country's foremost leaders in industry, government and education, who described the role of tool engineering in their various fields.

Special extras included the reading of a congratulatory telegram from President Dwight D. Eisenhower on ASTE's quarter of a century service, and a poem written for the occasion by Edgar A. Guest.

The Honor Awards Dinner on Saturday featured the presentation of six meritorious awards, two additional awards being presented above last year's four.

Election of the Society's president, officers and Board of Directors, presentation of some forty-two papers in the technical conferences, plant tours and ladies' activities were on the crowded agenda for this event.

In addition to convention activities, the Society's national officers, directors, committee chairmen and delegates concerned themselves with all phases of the Society's chapter and national activities.

The Board of Directors elected the 1957-58 officers, reviewed annual reports of all national committees and formulated plans for the coming year.

Newly elected national directors chosen by the House of Delegates are Edmund Hollingsworth and Frank F. Ford. Also on the board are: George A. Goodwin, first vice president; Wayne Ewing, second vice president; H. Dale Long, third vice president; David Schrom, secretary; and John X. Ryneska, treasurer. Directors elected to serve another term are: Charles M. Smillie, William A. Thomas, Philip R. Marsilius, Joseph L. Petz, Les-

Visitors to the Cameron Iron Works have a close-up view of the results of a hammering operation while the forging is still white-hot.

Houston Host Committee wives welcome the visiting ladies at a reception on Saturday afternoon, March 23, in the Shamrock Room of the Shamrock Hilton Hotel.

lie C. Seager, Gustave B. Berlien and Irving H. Buck.

National committeemen for the coming year are: Francis J. Sehn, technical publications; Arthur Cervenka, constitution and bylaws; Donald Zierk, editorial; Arthur F. Gould, education; Fred J. Kampmeier, finance; A. H. d'Arcambal, honor awards; T. Bert Carpenter, judicial; Carl A. Darger, membership; Vern Gallichotte, professional engineering; Harry A. Paine, program; Howard C. McMillen, progress; George Bennett, public relations; James R. Weaver, research fund; and John E. Rotchford, standards.

Governor Price Daniel and Mayor Oscar Holcombe issued proclamations calling for observance of "Tool Engineering Week" in Texas and in Houston, March 23 through 28. Tool engineering was also honored with similar proclamations throughout the country.

Congratulations go to Houston's host committee for their hospitality and the time they devoted to making ASTE's Silver Anniversary Convention a memorable occasion.

Recipients of the National Honor Awards are, seated: Prof. Frederick Preator, Frank A. Shuler, and Earle Buckingham. Standing next to Hans Ernst, left, is James T. Sharkey, who accepted the award for Harry F. Vickers. Louis Polk was unable to attend the Awards Dinner.

Technical sessions planned for the convention were well-attended, as shown in this opening session of the Ceramic Tool Symposium, held in the Emerald Room of the Shamrock Hilton Hotel.

Honored at the first annual Eli Whitney Memorial Lecture is Louis Polk, right, president of the Sheffield Corporation. Above, Past President McMillen presents him with the plaque created for the occasion.

1957 CONVENTION

Plant tours attracted many of the convention-goers who are here pictured boarding a bus to the Cameron Iron Works., Inc.

Vincent Spahr, former National Constitution and Bylaws chairman is shown discussing the delegates' conference with Arthur Cervenka, right, current chairman, and H. Dale Long, national vice president.

Taking a break in the hospitality suite are from left: Mr. Miller, Rexolin Inc.; George M. Rice, speaker, Ren Plastics; Raymond Richards, Bakelite Co.; and William A. Laurey, Renaud Plastics Inc.

Mrs. H. C. McMillen, left, and Mrs. H. E. Collins are shown welcoming Mrs. C. K. Hay in the receiving line at the ladies' tea, Saturday afternoon.

ASTE Research Medal recipient, Hans Ernst, center, was speaker at the Honor Awards Dinner. Past Presidents Irving F. Holland, left, and Frank Curtis were marshals.

Speaker Lyle L. Payne, assistant vice president of engineering, Hughes Tool Co., left, was introduced by Jack Shannon, right, chairman of the Oil Industry Information Committee, which with the Houston chapter, sponsored the "Romance of Oil" program on Sunday.

SILVER ANNIVERSARY Broadcast

draws ASTE family together

☆ Houston

Chapters and guests gathered all over the nation, Canada and Australia, to participate in the Society's closed circuit audio broadcast emanating from the Emerald Room of the Shamrock Hilton Hotel in Houston, Texas.

Lighting the Society's twenty-fifth birthday cake candles on the banquet night are the incoming president, Harold E. Collins left, and the retiring president, Howard C. McMillen.

Society members and their guests are shown enjoying the Silver Anniversary Banquet in Houston.

banquet night

Dr. Daniel J. Martin, 37,000th member of the American Society of Tool Engineers is pictured receiving his membership plaque. Dr. Martin is vice president of engineering at Hughes Tool Co., and consultant to Chief of Ordnance.

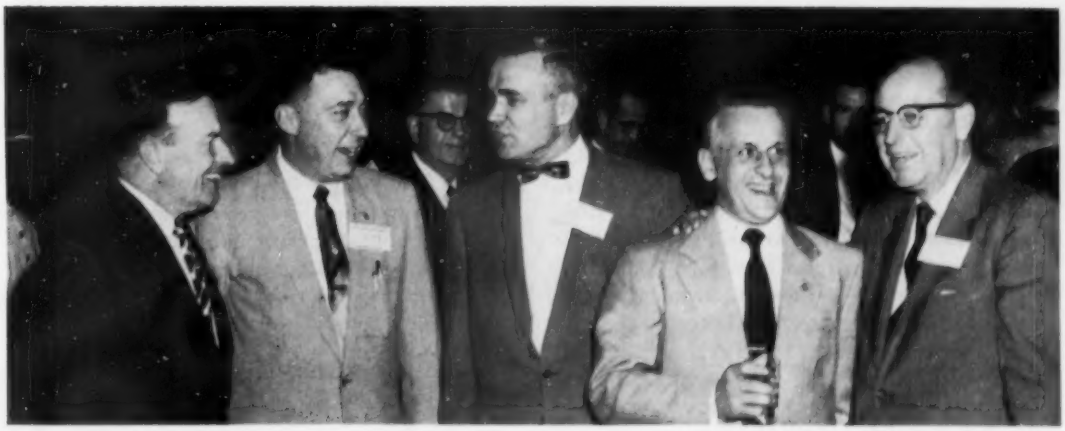
Discussing the closed circuit broadcast which was to begin shortly are from left: A. L. Jacobs; Mr. and Mrs. L. M. Krausse; and George C. Bennett, chairman of the National Public Relations Committee.

Mr. and Mrs. Ralph J. Meacher, Niagara District chapter joined in the Society's banquet festivities and also celebrated their twenty-fifth wedding anniversary.

John W. Greve, left, editor of *The Tool Engineer*, and Mrs. Greve, are shown talking with Mr. and Mrs. Dean Saurenman of the Houston host chapter.

Officers of the host chapter pictured at the social hour before the banquet are from left, C. K. Hay, vice chairman; Mr. and Mrs. J. W. Hindman, Jr., program chairman; Mrs. Hay; Mr. and Mrs. S. E. Rees, secretary, and Mrs. H. Otis Traughber.

Representatives of Hughes Tool Co. attending the banquet are from left: C. V. Kinney, plant manager; W. H. Siems, general sales manager; M. E. Montrose, vice president of sales; and H. E. Rogers, vice president of manufacturing and assistant general manager.



Meeting from all parts of the nation and Canada are, from left: Paul Watelet, Little Rhody; Elton Wenrich, Central Pennsylvania chapter; W. H. Weatherhead, Toronto; William Beach, Williamsport; and H. V. Bennett, Little Rhody.

John Finlay, Sr.

New chairman of the Sydney chapter is John Finlay, Sr., who was the first ASTE member resident in Australia. He joined the Society in 1932, the year of its founding. Known locally as the "father" of tool engineering in Australia, he has been associated with the field since 1905. In 1909, he was selected by the Commonwealth Government of Australia as one of six artisans sent to Pratt & Whitney, Hartford, who had the contract for equipping the Commonwealth Small Arms Factory. He worked there until 1911, testing the various fixtures for the manufacture of rifles, at which time he returned to Australia. Until his retirement, he was continuously associated with the Small Arms Factory, and is still acting as its consultant.

Reflecting local opinion of Mr. Finlay's contributions to industry, the Institution of Production Engineers has created a permanent scholarship in his name for students of production engineering in Australia.

Australian Chapter joins society roster

First off-shore chapter to be chartered during the impressive 25-year history of ASTE, Sydney, Australia, was also the first to achieve chapter status through the medium of transoceanic radio-telephone connections. This 9,000-mile link from Sydney to convention headquarters in Houston made the closed-circuit audio broadcast from that point to chapters all over North America the most extensive ever attempted.

Charter officers, speakers, and some hundred members and guests were present at the ceremonies on March 26, Sydney time. The program was arranged as a noon luncheon meeting, since that time would coincide with the 9 p.m. broadcast of the national audio hookup from Houston on March 25. After a royal toast, and a toast to the President of the United States, by Chairman Elect John Finlay, Sr., the second vice chairman elect, Ronald Howells, gave a resume of the occasion and purpose of ASTE in Sydney.

The radio link with Houston began at 12:30 p.m., during which the charter officers took their oath of office and were duly installed. The chairman's pin and charter were presented, after which Mr. Finlay sent the chapter's greetings to headquarters.

Interest in ASTE in Australia began in 1934, when John Finlay, Sr., returned to that country after joining the organization during a two-year stay in the United States. During the next twenty odd years, other tool engineers became interested in keeping abreast of the latest manufacturing advances, and also joined as members-at-large, since no formal organization for production engineers existed in Australia at that time.

Beginning in 1954, more concerted efforts were made to encourage increased membership in the Society, with an eye to the eventual establishment of a chapter in Australia. An organization meeting in 1955, and a publicity meeting called in August of last year, to acquaint potential members with the benefits to be gained from a local chapter, were followed by a visit from Past President A. M. Sargent, who met many of the members there, and visited representative segments of Australian manufacturing plants.

The result of all these efforts was the official announcement in December that a Sydney chapter was possible, and that plans for including its chartering in the Silver Anniversary celebration were already under way.

Sydney officers congratulate each other on the chartering of their chapter. From left are: First Vice Chairman Cecil Curtis; Chairman Finlay; Treasurer Olive Symons; Second Vice Chairman Ronald Howells; and Secretary Herrmann Colton, who did the organizational work for the chapter.

Kenneth O. Hayes, right, of Sydney, looks over the anniversary issue of *The Tool Engineer* with Executive Secretary Harry E. Conrad, while visiting headquarters just before the Sydney chartering.

A few of the 250 prospective members at the "publicity meeting" held last October get acquainted with ASTE publications and other literature.

Chartering details were ironed out in the early part of this year by members-at-large. Seated: A. G. Dalgleish, J. Piggot, J. F. Maggs, and R. G. Single. Standing: J. Finlay, Jr., J. S. Marshall, A. Frazer, and R. Barter.

Delegates'

Gloria McClure, staff public relations assistant, and Carl Abbott, Detroit delegate, distribute printed resumes of the 12-Month Plan to National Secretary David Schrom and Willis J. Potthoff, National Technical Publications Committee.

Harry E. Conrad, executive secretary and conference chairman, rises to introduce the evening's speakers: President McMillen; C. M. Verbiest; Robert E. McKee; and Carl Abbott, 12-Month Plan Chairman.

Candidates for the Board of Directors come forward to be introduced at the Saturday evening conference, preceding the closed House of Delegates meeting on March 24, at which the new Directors were chosen.

Annual Assembly

ASTE's National Delegates, meeting in their general conference session following the Honor Awards Dinner on March 23, looked in retrospect at the successful conclusion of the Delegates' 12-Month Plan, and got a glimpse of what's in store for the Society and mankind twenty-five years hence through an inspirational address by President Howard C. McMillen.

The open session presented an opportunity for Board of Director nominees to be formally introduced to the chapter representatives. The delegates also heard about the ASTE Income Protection Plan from C. M. Verbiest, the Society's insurance counselor.

At this opening conference, Robert E. McKee, chairman of the National Education Committee, presented the delegates with a picture of the ASTE Self-Improvement Program, citing its actual operation in the Buffalo, New York, and Jackson, Michigan, chapters. Designed to help members keep abreast of the latest advances in tool engineering practices, the program provides a complete lecture course to chapter members, consisting of a series of technical topics covered by the top men in each field. The courses are planned and written under the auspices of ASTE, and will become available to all chapters interested which are able to enroll a sufficient number of men to make the program worthwhile.

The House of Delegates convened in a closed session on the following afternoon to elect the Board of Directors for the year 1957-58.

Norman Watkins, right, delegate from Wichita, discusses some fine points covered in the conference, with William T. Wright and Frank E. Menard of Santa Clara Valley.

Delegates from far-flung chapters gather together to hear what the future holds for their society, and to take home reports of the successful year just ended.

Conferring before the educators luncheon are: R. H. Williams, principal of Regan High School; K. J. Trigger, National Education Committee; John Moses, principal of the Spring Branch High School; R. B. Sparks, principal of the Robert E. Lee School; and W. B. Mansfield, engineering extension service, Texas A & M College.

EDUCATORS confer

Leaders in the field of engineering education from the southwest segment of the nation met at the Regional Educators Conference held during convention week. Robert E. McKee, chairman of the National Education Committee which sponsored the conference, presided over the luncheon meeting.

The object of the conference was to discuss the preparation necessary for careers in tool engineering. A comparison was made of the roles played by colleges, technical schools and industrial training programs in fulfilling these requirements.

Professor Frederick Preator, head of the Tool Engineering Department at Utah State Agricultural College, acted as moderator and general chairman of the conference.

Completing final arrangements for the Regional Educators Conference are Chairman Frederick Preator, and Albert V. Payne, president, Mohawk Valley Technical Institute.

Oliver Hulley, National Education Committee, is shown talking with Nicholas A. Kinney, Mohawk Valley delegate, and Victor Fitting, Syracuse delegate.

Fred Lyijynen, left, Plastic Tooling Symposium chairman chats with speakers Lewis Bogart, and William Weaver, who covered applications and limitations of plastic tools.

Paul Brainard, center, of the National Program Committee, checks out speakers Jens Wennberg, left, and R. D. Halverstadt before a session.

technical Sessions

Shown discussing the next session are, from left, Harold W. Fink, meeting manager, his assistant, Amos Crawford, Speaker Prescott Smith from MIT, and Brigadier General Theodore Weyher, general chairman of the Plastic Tooling Symposium.

Convention Candids

Texans all!

Well-attended technical session

Fashion shows for the ladies

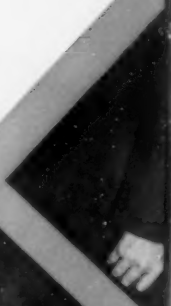
ASTE rodeo fans undaunted by the weather

V.P. Wayne Ewing and Clyde P. Elliott, of Denver

Texan calf roping

Tour of Cameron Iron Works, Inc.

Convention CANDIDS



143rd Chapter

ASTE's newest chapter was officially installed on January 13 in Birmingham, Ala. Looking on as their chairman receives the baby bottle from Staff Administrator Anthony Downey are, from left: C. A. Blomstran; Thomas C. Ford; Porter Landrum; Anthony Downey; H. C. McMillen, 1956-57 national president; R. L. McDaniel, second vice chairman; and R. J. Weisheit, first vice chairman.

• Birmingham

Birmingham officers proudly display their new charter.

Guiding Birmingham chapter activities will be these officers, from left: C. A. Blomstran, secretary; W. R. Gillies, professional engineering; T. C. Ford, treasurer; R. J. Weisheit, first vice chairman; Porter Landrum, chairman; W. E. Webster, constitution and bylaws; R. L. McDaniel, second vice chairman; John Van Tassel, program; L. M. Lynch, technical publications; A. H. Mayhall, public relations; Homer Hooper, membership; and J. E. Wilkinson, editorial.

Los Angeles Awards Annual Scholarship

The Los Angeles chapter presented its second annual scholarship award of $250 to Harold Cantrill, senior in mechanical engineering.

In announcing the award, F. X. Bale, past chairman, stated "We hope that this annual award will help maintain the interest of local engineering students in the rapidly growing field of tool engineering. Our industries badly need high-caliber tool engineers to help maintain our standards of living and our way of life."

Harold entered California State Polytechnic College in the fall of 1953, and first became interested in tool engineering last year when a student chapter of ASTE was organized at the school. Since then he has taken all the elective courses offered in tool engineering and chose a tool engineering project for his thesis. This project is the design and construction of a six-stage, continuous loading milling fixture.

Last year's student chapter program chairman, Harold is now second vice chairman.

Employed by the Empire Star Mining Co. for three summers, Harold worked in the blacksmith shop where he assisted in the hot milling of rock bits, and in the machine shop where he did general repair work, running a large lathe (26-inch throw, 30-foot bed).

Upon graduation this spring, he is planning to go on to school and take graduate work in the field of tool engineering.

Instrumental in choosing the scholarship recipient were Harold Hayes, Dean of California State Polytechnic College; J. O. Richardson, head of the Mechanical Engineering Dept.; C. C. Richards, faculty counselor; and Professor Francis F. Whiting, faculty adviser and head of Machine Shop Dept.

LOS ANGELES—George Adams, National Book Committeeman and a member of the chapter education committee; and Francis Whiting, professor, California Polytechnic College, look on as Harold Cantrill receives the annual chapter scholarship award from Frank X. Bale.

chapter news and views

Little Rhody Hosts Joint Society Meeting

Little Rhody chapter entertained as guests, members of the local Society for Metals and the Quality Control Section of A.S.Q.C. at a recent meeting. The technical program was The DoAll Co.'s "The Story of Measurement." The traveling display was described and the accompanying slides narrated by C. G. Shelley of the Wilke Foundation.

At the meeting, attended by more than 100 members and guests, the incoming officers were introduced. Six new members were presented membership pins by Chairman Elect Horace Bennett. —*R. H. Kilbane*

INDIANAPOLIS—Stanley R. Cope, president of Acme School of Die Design & Engineering, left, who discussed deep drawing and stamping die problems, is pictured with Chairman Richard A. Garber. —*Ronald E. Morris*

LANSING—Pictured after a meeting on milling procedures are John Golata, former chapter officer; Hans J. Wissner, guest engineer from Ebersbach, Germany; R. J. Krumrie, editorial chairman; and Hugo Vedder. —*R. J. Krumrie*

Springfield, Mass. Sponsors Courses

Approximately 120 members, friends and apprentices attended courses at Springfield Trade Evening High School. Arrangements were made by Joseph B. Moles, education committee chairman. The first of two twenty-hour courses was "Techniques of Executive Training," taught by Charles A. Baulch, director of training in American Bosch Div. of American Bosch-Arma Corp. The second course, "Job Processing Machined Parts," was taught by Elmore Felton, assistant supervisor of process and methods at Hamilton Standard Propeller Corp.

Chapter News and Views

PITTSBURGH—E. S. Phillips, chapter chairman, and Walter Coles, treasurer, discuss their profession of tool engineering with Ted Malone, roving reporter for the National Association of Manufacturers' radio series, "It's Your Business." A nationwide interview with the two was broadcast on the March 9 program.

Talk at Buffalo-Niagara on Russian Education

A talk by Edward Keonjian of GE, "A Look at the Professional Education Behind the Iron Curtain," was on Buffalo-Niagara Frontier's agenda. Mr. Keonjian, who was born in Southern Russia and studied electrical engineering at the University of Leningrad, came to this country in 1947 and in 1951 joined the engineering staff at GE for the development of advanced transistor circuits. His talk concerning education in Russia was very instructive.

—George Gasior

Atlanta Announces New Officers

M. P. Ulrickson, manager of the Tooling Standards dept. at Lockheed Aircraft Corp., has been elected chairman of Atlanta chapter. Other officers include: R. L. Wells, first vice chairman; L. C. Volherding, second vice chairman; E. D. Dattler, secretary; C. C. Lowrey, treasurer; and C. F. Bolden, delegate.

C. A. Barrett of the Die-Draulic Grip Inc., presented a lecture on the use of hydraulic die pad pressure systems.

—L. C. Volherding

Cemented Carbides Subject at Birmingham

W. L. Kennicott, chief engineer of Kennametal Co., Latrobe, Pa., discussed "Design and Application of Cemented Carbide Tools" at a recent meeting. Bridging the gap between research, development and actual production work was discussed. Chalk drawings served to illustrate the type of equipment used to establish factors in design of carbide tools.

The discussion included an explanation of the forces working on a tool during operation and also the effect of temperature on the tool. A design of a trouble-free carbide tool was suggested. Mr. Kennicott showed a film of various types of carbide tools in operation upon conclusion of the lecture.

—J. E. Wilkinson

Tucson Officers For 1957 Announced

Elections at Tucson resulted in the following men named as officers for the coming year; chairman, Lester G. Detterbeck; first vice chairman, Harry C. DeLong; second vice chairman, Clark Pierce; secretary, Stephen F. Cassedy; and treasurer, Joseph W. Vincent. John Oberteuffer was elected national delegate, with the new chairman acting as alternate delegate.

At the technical session following the elections, G. O. Murrell of G.E.'s Metallurgical Products Division explained and demonstrated the highly technical Carboloy machinability computer.

Dr. Gino Pestelli, right, visiting public relations director of the Fiat plant in Italy learns from National Technical Publications Chairman Fran Sehn, left, and Executive Secretary H. E. Conrad that over 100 tool engineering decisions lie behind such a simple product as a mechanical pencil.

WINDSOR—Shown from left at Windsor chapter's standards committee meeting held at the Chrysler Center are: William H. Madcock, chapter standards committee chairman; L. Meyers, General Electric Company, Detroit; and Ernest A. Clifton, Windsor chapter chairman. *—James H. Challoner*

Windsor Holds Standards Committee Meeting on JIC Electrical Standards

Over 60 members and guests of Windsor chapter met at the Chrysler Corp. of Canada to discuss the Joint Industry Conference Electrical Standard. The purpose of this meeting was to familiarize the chapter membership and other technical and maintenance personnel with the content of the standard and its value in improving industrial equipment.

The chapter standards committee, with W. Maddock as chairman, acted as a panel to lead the discussion. L. Myers, General Electric industry control specialist of Detroit, was on hand to answer special questions pertaining to electrical standards.

Following the showing of a film entitled "Productive Maintenance," the moderator, Mr. Maddock of Standard-Modern Tool Co., Ltd., started the discussion with a brief introduction to the JIC Electrical Standard. Using copies of the standard provided by the Ford Motor Co., everyone present followed along as each member of the panel presented a summary of a section of the standard: A. Hopkinson, Ford Motor Co. of Canada, diagrams; E. Clifton, Bendix-Eclipse of Canada, general standards; N. Paddison, Chrysler Corp. of Canada, protection; H. Crowder, Ford Motor Co. of Canada, motor branch circuits; G. Kovosi, Bendix-Eclipse of Canada, enclosures and mountings; C. Wilson, Cope and Garrison, panel wiring; D. Nesbit, General Motors of Canada, motors; O. Emery, Chrysler Corp. of Canada, wiring and reduced voltage circuits; F. Atkins, General Motors of Canada, conduit and raceways; B. Foster, Standard-Modern Tool Co., gaskets and miscellaneous.

Vigorous discussions of problems pertaining to industrial equipment ensued.

—J. Challoner

Long Beach Makes Chrysler Plant Tour

In groups of ten, 124 members of Long Beach chapter toured the Los Angeles assembly plant of Chrysler Motor Corp. in January. Of particular interest to the visitors was the body-to-chassis joining operation, along with the perfect timing of the various moving lines which converged into a single line.

Preceding the tour, the host company served dinner to its guests.

Philadelphia Members Celebrate Chapter's 19th Birthday

PHILADELPHIA—Charter Chairman Conrad Hersam cuts the cake at the chapter's 19th birthday celebration which honored past chapter chairmen.

The occasion of Philadelphia's 19th birthday was celebrated by honoring the chapter's past chairmen as dinner guests. Ten of the seventeen living past chairmen were in attendance at the meeting, which drew 150 members and guests.

Election of officers was held, with the following results: chairman is Walter Lees; first vice chairman, William Chalfont; second vice chairman, Harland Fullam; secretary, Leonard Horoff; treasurer, Erik Lund; delegate, Edward Wheeler; and alternate delegate, Walter Lees.

The technical meeting was devoted to a talk on electrolytic grinding by J. A. Mueller, manager of Carborundum Co.'s grinding laboratory. The method uses a carbide tool as an anode which is brought into contact with the cathode, a rotating diamond wheel. The metal is immersed in an electrolytic solution, is dissolved at the anode in accordance with Faraday's Laws, and wiped away with the rotating action of the cathode, resulting in controlled metal removal. This method reduces diamond wear by 90 per cent, and gives five times more performance per wheel. Mr. Mueller cited other economies and advantages to the process.

—John Chernokreluk

WENTWORTH INSTITUTE—*The Tool Engineers Handbook* and *Die Design Handbook* were presented as first and second prizes, respectively, to winners of a technical presentation program organized by chapter officers and Charles Moody, left, faculty adviser. Student Chairman Robert Chagnon, second left, presents the first prize to Charles McPherson for his talk on broaching, while Joseph Tansey, right, Dean of Students, presents the second prize to Anthony Campagna, who spoke on industrial photography.

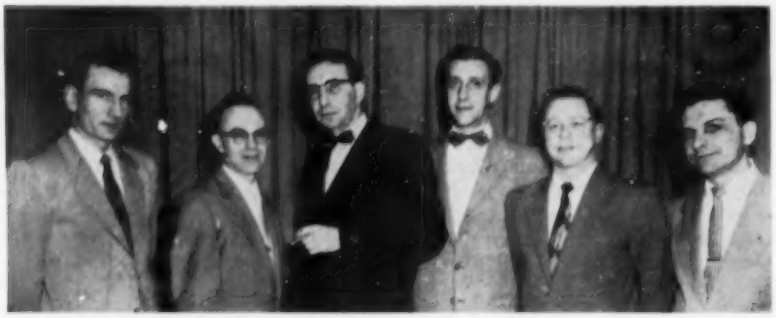
—James B. Metcalf

PEORIA—H. Dale Long, center, national vice president, installed chapter officers for the coming year. Shown at the meeting are, from left, Toastmaster Duane Brighton, Caterpillar Tractor; Walter Ballard, Retiring Chairman; Leo Johnson, new chapter chairman; and speaker of the evening, Harry Conn. Mr. Conn's subject was "Tooling for Automation."

—G. K. Davison

Chapter News and Views

MADISON—Guests at the recent Education Night program were students of local high schools and their advisers. Standing, second from left, Dean Kurt Wendt, University of Wisconsin School of Engineering, was the speaker. *—Dale M. Dulin*



GRANITE STATE—1957-58 officers installed at the Annual Ladies Night dinner-dance are, from left: secretary, Richard Downing; second vice chairman, Robert Ellison; chairman, Joseph Rosseau; retiring chairman and installing officer, Gino Magnani; first vice chairman, Fred Wakefield; and treasurer, Carmel Radvan. *—Norman Fine*

SPRINGFIELD, MASS.—Participants in Springfield's newly inaugurated educational progam are, from left: Elmore Felton, Dennis J. Brunton, Charles A. Baulch and Joseph B. Moles. *—Allen M. Johnson*

MID-HUDSON—Joseph L. Petz, left, national director, installed the chapter's newly elected officers at the last meeting. They are, after Mr. Petz; Michael N. Hall, first vice chairman; Vincent J. Cavalieri, treasurer; Frank N. Plotnik, retiring chairman; Harry Heller, chairman; Harold J. DePew, second vice chairman; and Arthur J. LaRue, secretary. *—Atilla G. V. De Illy*

Houston Welcomes New Members

New members were welcomed at Houston chapter. Jack T. Welch, general manager of the Machine Tool Div. of The Sheffield Corp., discussed the principle of crush dressing the abrasive wheel, its advantages, and when to apply to production. The wheel grade, the materials used for crushers, the crusher sfm, the workpiece finish, and the production to be expected under various conditions were also discussed.

Officers elected include: Paul Langdale, chairman; S. E. Rees, first vice chairman; C. K. Hay, second vice chairman; Harry Betts, secretary; A. G. Meyer, treasurer; John D. Bailleres, national delegate; and Paul Langdale, alternate. *—W. H. Reifschneider*

Material Handling Subject at Hamilton

"Evolution of Material Handling" showing the progress of materials handling from the days of the Egyptians to the present was the subject presented at Hamilton's meeting. Speaker George L. Bowie, general superintendent of material production and control, General Motors Diesel Ltd., London, was assisted by Al Logie, also of the same company.

Slides showing examples of materials handling methods in use in divisions of General Motors in Canada and the United States were shown.

Chairman Joseph Sheldon presented the service award to Ron Tipping, program chairman. Five new members received their ASTE pins.

—Russ Wilson

Twist Drill Talk Heard at Monadnock

Monadnock's February meeting was devoted to the subjects of twist drills and drilling. Speaker Carl J. Oxford, Jr., chief research engineer at National Twist Drill and Tool Co., Rochester, Mich., explained some of the theories behind drill operation, and experiments made to check the theories. The slide-illustrated talk also included a discussion of special type drills and their applications.

Results of the election at Monadnock are as follows: James Franciscus, chairman; Raymond Carter, first vice chairman; Robert Burr, second vice chairman; Charles King, secretary; and Earle Quimby, Jr., treasurer. Richard Swahnberg was named delegate, and the new chairman, alternate.

—David A. Piper

The Nike System Described at Hartford

Captain R. H. Ball of the US Army presented a talk supplemented with a movie on "The Nike System of Defense and Protection of the United States." Captain Ball pointed out that after World War II, the effectiveness of aircraft bombing brought out the perfection of an accelerated guided missile program. The word "Nike" was taken from the name of the Greek goddess of victory.

The launching site establishment and the system of relaying information as to identifying aircraft was briefly described. Present installations are sufficient in number to provide protection for covering industrial and heavily populated areas.—*C. Morgan Newbury.*

NIAGARA DISTRICT—First formative meeting of the chapter's book committee shows the following people in attendance: seated, F. W. Bird; E. A. Lindwall; R. G. Dittrick, book committee chairman; J. Rankin; and J. Miller. Standing are: O. Bergman and R. Lloyde. A shuttle type drill fixture was submitted by the committee for adaptation to the *Jig and Fixture Design* book now in progress. A talk on "Flow of Metal in Deep Drawing Operations on Aluminum" was presented recently by John W. Lengbridge of Aluminum Goods Ltd., Toronto, to an audience of 120.

Los Angeles Speaker Describes Chem-Milling

Guest speakers at the January meeting of Los Angeles chapter were George H. Fox, Jr., of Turco Products, and Commander A. M. Davison of the U.S. Coast Guard, Eleventh District.

Mr. Fox presented a discussion on the revolutionary "Chem-Mill' process, by which aircraft structures are chemically etched rather than machined. A color film showing the process in operation at North American's Downey plant was also presented.

The coffee speaker was Commander Davison, whose topic was "Duties of the U. S. Coast Guard." —*Gene Grahn*

Lorain County Hears Dr. Osborn on Automation

Past President Dr. Harry B. Osborn, Jr., in a two-part talk to Lorain County members, commented on the nation's mass production techniques, then gave an informal report on industrial and living conditions in Japan as he had observed them on a recent trip there.

He claimed the country's present prosperity to be due to the production of more goods at lower cost for more people, and commented on the high productivity per man hour. In back of our industrial success he saw courageous investors, imaginative designers and inventors, and skilled tool engineers.

Fox River Valley Hears Measurement Expert

John Harrington, chief engineer of The DoAll Co., spoke to the chapter on the principles and techniques in precision measurement. Mr. Harrington's discussion included the history of measurement, the science of precision measurement, common mistakes in measurement, surface finish, and new techniques for using gage blocks directly in measurement. The lecture was accompanied by a demonstration of inspection equipment.

New officers for the 1957-58 term are: H. L. Smith, chairman; R. H. Keck, first vice chairman; W. D. Phillips, second vice chairman; R. N. Kastoll, secretary; and O. Andersen, treasurer.

—*R. H. Keck*

WESTERN MICHIGAN—Execuive Secretary H. E. Conrad, seated center, installed the chapter's 1957-58 officers recently. They are, seated, John Pridgeon, chairman, left, and James Wagner, first vice chairman. Standing are James Rost, second vice chairman; Joseph Antonucci, secretary; and Edward Stouten, treasurer. The Bellows Co. film, "Operation Pushbutton," was also shown at the meeting. —*J. Antonucci*

Kentucky Proclaims Tool Engineering Week

The Louisville chapter announced that Kentucky's governor, Albert B. Chandler, and the mayor of Louisville, Andrew Broaddus, proclaimed the week of March 24 through March 30 as "Tool Engineering Week in Kentucky and Louisville," in honor of the Silver Anniversary Convention of the Society. Some 190 members of the chapter joined in the celebration held in conjunction with the Houston convention.

The proclamation acknowledged that the economic strength of the state depends on industrial expansion; that the production and manufacturing fields have been greatly benefited through the advancement of scientific knowledge by ASTE. —*James W. Lusk*

Chapter News and Views

WORCESTER—New chapter officers are shown, from left: R. S. Morrow, second vice chairman; A. S. Hamilton, treasurer; Arthur Lawler, Jr., secretary; D. W. Hoyt, first vice chairman; Dr. Leo P. Tarasov, retiring chairman and national delegate; and John C. Lalor, chairman. *—Leon F. Miller*

Electroforming Topic At Albuquerque Meeting

Nicholas Sennala, engineer of the Sandia Corp., spoke on electroforming as a means of producing intricate shapes not possible by conventional methods. He used many articles for illustrations such as fountain pen caps, plastic molds, microwave antennae and copper clad coaxial cables. Copper, iron, nickel, cadmium and chromium were used in his samples.

Leslie Seager, national committeeman from Salt Lake City, was present and reviewed national activities.

Officers installed are: Paul Stewart, chairman; James R. Felter, first vice chairman; Robert Frow, second vice chairman; Everett Gray, secretary; Arthur Stuart, treasurer; H. R. Hanan, delegate; and P. L. Stewart, alternate delegate. *—Arthur Stuart*

Northern Massachusetts Elects New Executives

Election results at Northern Massachusetts show the following men in charge of chapter affairs for the coming year: Stuart E. Sinclair, chairman; George Stanley, first vice chairman; Herman A. Wojdylak, second vice chairman; Raymont R. Clement, secretary; John Turton, treasurer; and Alvin B. Cook, delegate. Alternate delegate is the new chairman.

At the technical session, Franklin Meyer, Jr., of the Instrument Gage Div., Taft Pierce Co., Woonsocket, R. I., spoke on the applications of instrument gages to production inspection problems. His talk covered all types of air gage applications, from simple handwheel types to fully automatic and machine controlling devices.

—Herman A. Wodjylak

FORT WAYNE—Shown in discussion are: David Chambers, program chairman, and Edward W. Dickett from Sundstrand Machine Tool Co., who spoke on "The Machine Tool Builder and the Tool Designer," and Gordan Anderson, Sundstrand. *—Russell D. Snyder*

Plastics for Tooling Discussed at Montreal

The supervisor of Canadair's plastic tooling shop, E. Meldrum, compared plastics with metal in the manufacture of tooling at Montreal's meeting on February 20. Special mention was given to the dimensional stability of epoxy resins and their uses in producing fine tolerance tooling. Examples of drop form dies and samples of work requiring intricate plaster cores were displayed. *—M. Dempsey*

members on the MOVE

Robert E. McKee, Cincinnati, chairman of the National Education Committee, has been appointed training director of The R. K. LeBlond Machine Tool Co.

Wallace E. Carroll, a member of the Research Fund Committee and Rockford chapter, has been appointed to serve the Government for a six-month period as director of the Metalworking Equipment Division.

Harry Pelphrey, Detroit, author of various articles for THE TOOL ENGINEER, has been appointed director of engineering research, Michigan Tool Co.

Albert Henke, Indianapolis, received The Distinguished Salesman's Award sponsored by the Indianapolis Sales Executives Council.

Peter Iaffaldano, Cleveland, has been appointed field engineer for Norton Co.'s Cleveland district office.

Horace A. Sevier, Baltimore, has been appointed chief engineer for Gerotor May Corp.

Stewart G. Fletcher, Pittsburgh, has been promoted to position of vice president-metallurgy, Latrobe Steel Co.

Two Cleveland chapter members have received promotions in the Cri-Dan Div. of the Lees-Bradner Co. **Anson Laufer** was named head of the division, while **John Montean, Jr.** replaces Mr. Laufer as assistant manager.

Chester I. Bosket, Binghamton, has been appointed project manager of second shift machining departments in IBM's Endicott plant.

Robert L. Larson, Chicago, has been appointed general manager of the new Indianapolis plant for Joseph T. Ryerson & Son, Inc.

H. J. Siekmann, Detroit, is the newly appointed manager of the applied mechanics engineering group formed at GE's Metallurgical Products Dept.

GOLDEN GATE—Shown informally following a technical session on duplicators are, from left: Elmer Hallberg, director of engineering, Rockford Machine Tool Co.; Phil Freeman, fist vice chairman; and Ben Dathe, program chairman.

Press Equipment Topic at Lima

Speakers at Lima's technical meeting were William H. Schug, liaison engineer for V & O Press Co., Hudson, N. Y., and Chester H. Hamilton, sales engineer for Henry & Wright Co., Hartford, Mich. Slide illustrations were shown on specific press equipment which included applications of tools, equipment, feeds, guards and products. Several different products were shown being dial-fed to presses and some complete assembling processes such as ball and roller bearings.

William Epley is the new chairman; Gene Siferd, first vice chairman; Vince Spahr, second vice chairman; Donald Cox, secretary; and William Waters, treasurer.

On March 12, the chapter toured the Continental Can Co. Guests included Mrs. Dupler, instructor of mathematics at Cridersville, Walt Armes and Glen Hastings, students. *—George Johoske*

St. Louis Chapter Installs New Officers

H. Dale Long, national vice president, acted as installing officer at St. Louis' recent installation ceremonies. He spoke on the past 25 years of progress in tool engineering, and the challenge imposed to the tool engineer in the present and future.

Newly installed chapter officers are: Vincent L. Bene, chairman; Charlton A. Brown, first vice chairman; Kenneth Ritter, second vice chairman; Miss Paulena Pagel, secretary; and Frank C. Schillinger, treasurer.

Richard L. Waddell, management editor of Business Week magazine, gave an informative talk on trends in business management at the same meeting. *—W. A. Scheublein*

ROCKFORD—Lester Teachout, chairman of the engineering education committee, presents one of the certificates of merit awarded to five high school students for skilled draftsmanship in a recent competition. The three top winners also received cash awards. Students from left are: Kenneth Ahlberg, Edward Halzel, James Hanna, Terry Beal, and Dave Polaski. *—Lawrence E. Geiger*

Position Available

LONG-ESTABLISHED CONCERN will consider applications for competent Sales Engineers and Sales Administrators or Assistants with thorough knowledge of gear manufacture and design, fine and medium pitch. Permanent and well-paid positions to qualified applicants. Send full case history and advise expected salary in first letter; also advise on territorial preferences, if any. Write to: Box 098, News Dept., The Tool Engineer, 10700 Puritan Ave., Detroit 38, Mich.

San Diego Observes National Engineers Week

Joining forces with some twenty local technical societies, members of ASTE's San Diego chapter actively participated in the observance of National Engineers Week. Highlight of the week-long activities was the four-day "Engineering Exposition," visited by an estimated 10,000 people.

San Diego members manned an appropriately decorated ASTE booth, at which all of the Society's technical publications were displayed, and literature on tool engineering as a career was distributed.

Among other exhibitors were some fifty local industrial concerns; city, county, and state engineering departments; the U. S. Navy; and several other technical societies. *—T. E. Sweet*

TUCSON—Three past chairmen pose with newly elected Chapter Chairman Lester Detterbeck, right. Past chairmen, from left, are James Beach, Simon Jacobsen, and John Oberteuffer. *—C. J. Doubeck*

Obituaries

Harold Bagnall, Niagara District, general foreman, Thompson Products, Ltd., Automotive Mfg. Div.

Willard Jackson, Detroit chapter, sales engineer, Braeburn Alloy Steel Corp.

Robert J. Matschke, Golden Gate, tool designer, Friden Calculating Machine Co., Inc.

Nazzareno Pezza, Boston, precision machinist, Walenar, Inc.

William Rahe, Toledo, plant manager, American Metalcraft.

C. J. Rainey, Peterborough, manufacturing engineer, Canadian General Electric Co., Ltd.

H. J. Stock, Toronto, sales engineer, Sykes Tool Corp.

Coming Meetings

Regional

SPRINGFIELD, MASS.—New England Regional Conference and Massachusetts Tool Engineers Day, May 3, 9 a.m.—9 p.m., Hotel Sheraton-Kimball. Luncheon, 12 noon. Plant tours in morning; technical panel discussions in afternoon. Banquet, 7 p.m. Speaker, vice president in charge of engineering of AT&T Co.

TORONTO—May 6-10, Industrial Tool and Production Show.

Chapter

ANN ARBOR AREA—May 15 and 16, Goebel Brewing Co., Detroit. Plant tour for members only; limit, 75 reservations each night.

BATTLE CREEK—May 20, 6:30 p.m., American Legion Clubhouse. "Vibration Analysers and Dynamic Balancers" by Ted Ongaro.

DETROIT—Regular section, May 23, 7:30 p.m. Joint Meeting with Education. Plant tour of Chevrolet Spring and Bumper plant. Carbide section, May 16. ESD small auditorium. Jack R. Workman on "Talide Metal Wear Applications" with sound color film. R. T. Beeghly, vice president and general manager of Metal Carbides Corp. conducting question period. Refreshments at Latin Quarter.

ERIE—May 4, 10 a.m. Plant tour of Clark Bros. Div. of Dresser Industries, Olean, N. Y. Bus leaves Erie Greyhound Terminal at 7 a.m.

FORT WAYNE—May 8, 6:45 p.m., Tri-State College, Angola. Tour of campus and facilities at Tri-State College. Speaker to be announced.

GRAND RIVER VALLEY—May 3, Leisure Lodge, Preston, Ont.

HAMILTON DISTRICT—May 3, 6:30 p.m., Fischer's Hotel. Annual Ladies Night.

INDIANAPOLIS—May 2, 8 p.m., Antler's Hotel. Film—1956 "500" race—with DeSoto as the pace car by Chrysler Corp. executives. Well-known "500" drivers, plus Duane Carter, president of U. S. Auto Club.

KALAMAZOO—May 23, 8 p.m., Room A, YMCA Bldg. M. Movies, "Cutter Grinding" and "Grinding Carbide Tools." Speaker, Norton Co. engineer.

KEYSTONE—May 20, 7 p.m., Castle Restaurant, Scranton. "Electrical Discharge Machining" by Charles Adams, sales engineer, Elox Corp.

LITTLE RHODY—May 2, 6:30 p.m., Johnson's Hummocks. William Watson, personnel manager, Hammel-Dahl Co. Plant tour of Hammel-Dahl Co.

LONG BEACH—May 8, 7 p.m., Petroleum Club. "Automation by Numerical Control" by Western and Southern District sales manager for Giddings & Lewis Machine Tool Co. Film included.

LONG ISLAND—May 13, 8:30 p.m., Garden City Hotel. "Educational Needs of a High School Student" by Dr. Lawrence L. Jarvie, executive dean of the State University of New York.

LORAIN COUNTY—May 1, 6:30 p.m., Gardner Inn, Elyria.

LOUIS JOLIET—May 21, 6:30 p.m., Woodruff Hotel. "Human Engineering and Design" by L. W. Sahley of Cleveland Design and Consultants, Inc.

MACOMB—May 2, 6:30 p.m., Roma Hall, Gratiot at 10 Mile Road. "Electrical Discharge Machining" by Joseph L. Montgomery, Jr., sales manager of Elox Corp. Also film.

MANSFIELD—May 16, Cleckner's Recreation Center. "Use of Cypack Static Control System by John Postingl, engineering supervisor of Westinghouse Electric Corp.

MERRIMACK VALLEY—May 2, 6:30 p.m., Tyer Rubber Co., Andover. Plant tour.

MID-HUDSON—May 14, 7 p.m., Mirabelle. "33 Days in the Canadian Yukon" by Elway P. Gray of Last Word Sales Co. and Gray Grimes Tool Co. Final meeting of season.

MILWAUKEE—May 9, 6:30 p.m., American Serbian Memorial Hall. "Standards of Equipment for Measurement of Surface Finish" by speaker from Brush Electronics Co. Entertainment.

MONADOCK—May 8, Hotel Moody, Claremont. Plant tour of Joy Mfg. Co. Joint meeting with Twin States chapter.

NEW HAVEN—May 9, 9:00 a.m. and on for registration. Dinner 6 to 7 p.m., Hartford New Statler Hotel. "Connecticut Day" by William Case, manager. Commercial Developments, Sylvania Electric Products, Inc. Plant visit 9:30 a.m. to 3 p.m.

NORTH TEXAS—May 18, Aluminum Co. of America. Plant tour.

NORTHWESTERN PENNSYLVANIA—May 2, 6:30 p.m., Moose Club, Emporium. "Numericord and Recordotrol" by D. M. Laflin.

OKLAHOMA CITY—May 7, 6:30 p.m., Okla. City University Green Room. "Plastic Tooling" by John Tarvin of Devcon Corp.

OZARK—May 16, 7:30 p.m., Sebastian Diesel Equipment Co. "Fishing and Hunting" by Clarence Daniels, Missouri State Conservation and Wild Life Agent, and Johnny Holmes, director of sports, KODE—TV. Buffet luncheon.

PORTLAND, ME.—May 3, 2 p.m., Saco-Lowell, special Products Div., Biddeford, Me. Plant tour.

PORTLAND, ORE.—May 23, 6:30, social; 7, dinner; 8, meeting, Burns Restaurant. "Automation by Numerical Control" by Donald M. Laflin, Western and Southern District manager, Giddings & Lewis Machine Tool Co.

RIVERSIDE—May 14, 7 p.m., Mike's Cafe. "Steel for the Ages" film.

ROCHESTER—May 6, Past Chairmen's Night. "Ceramics" by Edward Kibbett of Carborundum Co.

SAGINAW VALLEY—May 16, Flint. Program, "New Automatic Machines," Buick Motor Division, Plant No. 5.

SAN DIEGO—May 14, 7 p.m., El Morocco Club. "Automation by Numerical Control" by Donald M. Laflin, Western and Southern District Sales manager, Giddings & Lewis Machine Tool Co. Slides and film.

SAN FERNANDO VALLEY—May 1, 7 p.m., Hody's Restaurant, North Hollywood. "Automation by Numerical Control" by Marlin E. Remley of Giddings & Lewis Machine Tool Co.

SAN GABRIEL—May 2, 6:30 p.m., Rainbow Angling Club, Azusa. "Automation by Numerical Control" by Donald M. Laflin of Giddings & Lewis Machine Tool Co.

SANTA ANA VALLEY—May 7, 7 p.m., Palm Restaurant. "Automation by Numerical Control" by Donald M. Laflin of Giddings & Lewis.

TRI-CITIES—May 8, joint meeting proposed with The American Society for Metals.

TUCSON—May 14, 6:30 p.m., dinner, 8:30, meeting. "Optical Tooling" by James M. Stolz, president, Opto Engineering Co.

TWIN CITIES—May 2, 6:30 p.m., The Covered Wagon. "Die Draulic Applications" by Edwin Stouten, Die Draulic Grip Co.

TWIN STATES—May 8, joint meeting with Monadnock. Joy Mfg. Co. tour.

UNIVERSITY OF KANSAS—May 10, 6:30 p.m., Kansas Room, Student Union, University of Kansas. "The Place in Industry of the Modern Engineer" by B. J. George, consultant engineer for Kansas City Power and Light. Installation of new officers.

WICHITA—May 8, 6:30 p.m., Wolf's Cafeteria. Film "Optical Tooling" and panel discussion.

WINDSOR—May 13, 7:30 p.m., Prince Edward Hotel. "Machine Tool Controls" by Edward A. Kirkham, project engineer for Pratt & Whitney Co.

chips and chatter

Alfred State Tech heard Dean John McMann, Dean of the College of Ceramics, speak on the humanities in the engineering field. Plans are under way for a baseball team and a spring picnic.

"Coated Abrasives, Their Manufacture and Application" was the subject discussed at **Central Pennsylvania** by representatives of Behr-Manning Co. Div., Norton Co., M. I. Jackson, division manager; A. D. Inners, sales engineer; and M. F. Bump, product engineer. Belt sanders and contact wheels were included in the discussion.

Clarence Beingessner, president and general manager of the B & W Heat Treating Ltd., discussed methods employed in the heat-treating industry at **London-St. Thomas.** New chapter officers include: chairman, Jess Pawley; first vice chairman, Al Trueman; second vice chairman, Howard Wright; third vice chairman, Bill Graham; secretary, Robert Pugsley; and treasurer, Harold Brannon.

John Hussey, sales engineer for the American Tool Works Co., Cincinnati, gave a talk on "Putting the Radial Drill to Work" at both **Los Angeles** and **San Fernando Valley** chapters recently. His discussion embraced such items as indexing trunnion jigs and other shop jigs and fixtures, and was accompanied by slides showing many unusual applications of the drill to machining problems.

Joseph Ebner was chosen to receive the special award pin of the **Milwaukee** chapter for his outstanding service to the chapter and the tool engineering profession. A past chairman and for many years a member of the executive board, he has contributed freely of his time and effort to the Milwaukee group.

At **Mississippi's** latest meeting, Tom Gardner of Bay State Tap and Die Co. spoke on better tapping methods. A report on activities of the 25 months prior to the chapter's recent chartering was read by Chairman George Mitchell, who also reviewed events since that time.

Oakland County members were entertained recently with a color movie, "Diamond Mining in South Africa," presented by Don Trescutt, Super Cut Diamond, Inc.

The possibilities and limitations of roto finish were discussed at **Racine's** March meeting by Roy T. Romaine, chief engineer of Roto Finish Co.

The **Rochester** scholarship award for tool engineering study at Rochester Institute of Technology was recently increased by the executive committee to $1500, with $700 payable for fees and tuition the first year, and $400 in the two successive years.

Rockford members heard Edwin F. Stouten, president of Capitol Engineering Co., talk on "The Designing of Dies Using the Barrett Die-Draulic." The method involves the use of hydraulic pressure built into the die cushion when drawing the sheet metal, he explained.

ASTE's national vice president, Wayne Ewing, who acted as installing officer at **Santa Clara Valley's** recent Ladies Night and Installation program, reviewed the interrelationship of the chapter and the national society. Past Chairman W. T. Wright gave the annual report and was presented with the past chairman's pin. After being installed as the new chairman, Dr. L. C. Cook conducted the final portion of the meeting.

Southeast Kansas elected the following officers: Louis Schwinn, chairman; Rex Sears, first vice chairman; Fred Savage, second vice chairman; Bernard Wade, secretary; and Warren Welch, treasurer. William Thomson is the new delegate and Chairman Schwinn, the alternate. At the previous meeting, N. A. Brunson, president of Brunson Instrument Co., Chicago, demonstrated the latest optical tooling equipment manufactured by his company, and described the plant's future location which will be completely underground.

The Dana Corp.'s Spicer Div. was host to **Toledo** members for a tour of the plant facilities recently. Elections held the same night resulted in the following men chosen to direct the chapter: James F. Sullivan, chairman; Julian Pawlina, first vice chairman; Lester Fox, second vice chairman; W. Earl Coon, secretary; Harold Krueger, treasurer; Philip Wood, delegate; and Lawrence Rothert, alternate delegate.

Twin Cities chapter awarded $100 scholarships to Maurice L. Pulgren, University of Minnesota; John A. Welk, St. Paul Vocational School; and John L. Hanson, Dunwoody Industrial Institute; and voted them a year's membership in the chapter.

Arthur R. DerDerian of Westinghouse Electric Corp., Sharon, Pa., spoke to **Western Reserve** on "Automation—What It Means in the Future to the Tool Engineer." He stressed that an exchange of engineering ideas and knowledge was a primary need in the continued industrial growth and increased defenses of our nation.

"Abrasive Tumbling" was the subject of Malcolm M. Maynes, polishing grain engineer at Norton Co., when he addressed **Worcester** members in March. He covered all phases of barrel finishing, including equipment trends and practical application to parts.

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Start with a speedy Grip-Master vise and fixture base.
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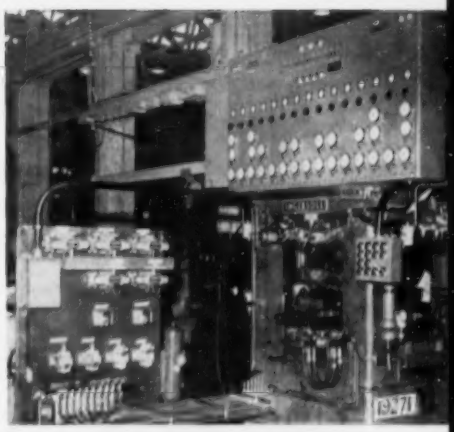
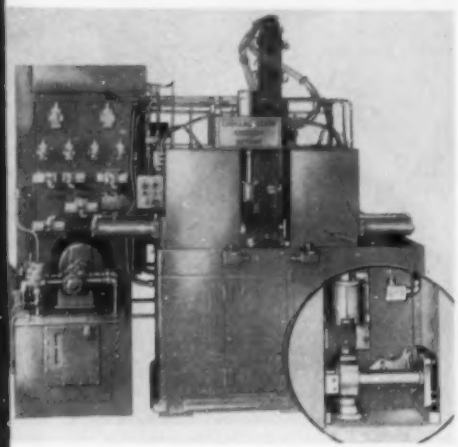


AUTOMATIC ASSEMBLY PROVIDES ECONOMY

Steering gear housing assembly operations are performed at considerable cost and time savings on this equipment made by Machine tool Div. of Cadillac Stamp Co. for an automobile manufacturer.

Five operations are executed in a 10-second cycle. It begins with hopper feeding and pressing in place of one welch plug; then two bushings are hopper fed and pressed in place. One ball race is pressed in place; ID of two bushings are burnished; ID of two bushings are inspected.



Inset in photo of automatic assembly machine shows parts in place for operation.

SPECIAL EQUIPMENT CULLS AS IT CHECKS

One of the elements in a new engine block transfer line, designed by The Ingersoll Milling Machine Co. for an automobile manufacturer, is a large gaging station that not only checks the products of automatic machining but also checks the result of an automatic assembly operation. Gaging elements and classifying equipment for the big unit was supplied by Federal Products Corp. while the handling, positioning, and control portion of the machine was made by Ingersoll.

The air-electric gaging equipment is placed in the transfer line to inspect the engine blocks and to mark the acceptable ones to show their relative size. Blocks that are not acceptable are not allowed to continue to the next operation.

A total of 20 inside diameters—two each in five crankshaft bores and two each in five camshaft bores are measured. In addition, alignment of oil holes in five bearing liners are checked for automatic assembly alignment with oil holes in the camshaft bores.

All inspections are made simultaneously. The measuring is done with ten air plugs which are automatically inserted into the bores. Each of the plugs for the crankshaft bores takes two diameter measurements at opposite ends of the bores and at right angles. Plugs for the camshaft bores make similar diameter measurements plus the oil hole location check.

If all 20 diameters and the alignment of the oil holes are within tolerance, a green light indicates that the part is good. A stamping unit then stamps a plus or minus sign on each end of the block to indicate whether the #1 crankshaft and the #5 crankshaft bores are above or below the nominal size within the tolerance limits. If any one dimension is outside tolerance limits, the block is shunted out of the transfer line unstamped.

This combination machine is capable of handling 95 engine blocks an hour. Time required to make all 25 measurements does not slow down the production line, but allows the parts to move along at their normal speed.

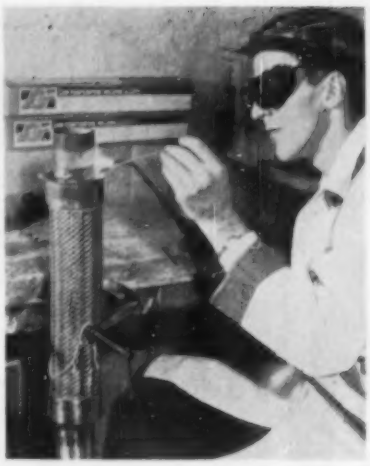
SELECTIVE ALLOY USE SOLVES BRAZING PROBLEM

Parts to make high pressure, flexible, all-metal hose caused a brazing problem for Nebar Supply Co. Although the parts ordinarily were made of bronze, dissimilar metals also were used occasionally for the components which included flexible accordion-walled tubing, wire braiding, collar and nipple. Even when these differently shaped parts were

all of bronze, their varied thicknesses compounded difficulty. Operators could not avoid overheating or burning thinner parts while getting heaviest parts to optimum brazing temperatures. Specifications were hard to meet, and a large number of rejects caused rising costs.

To solve the problem Welders Supply Co., which was consulted about the job, determined that the trouble stemmed largely from choice of brazing alloy and fluxes. The all-bronze job needed a strong alloy with a melting point sufficiently lower than bronze to permit a wide safety margin, a higher than usual elongation to withstand shock and vibration, and a flux that would augment the alloy's free flowing qualities.

An early thought, a silver brazing alloy, was considered too costly for the



purpose, although its working temperature was 1430 F, tensile 50,000 psi and elongation 16 percent. Answer to all requirements eventually appeared to be a phosphor copper silver brazing alloy called All-State No. 23. Its working temperature was only 1270 F, its tensile strength 50,000 psi, elongation 25 percent, and its cost advantageously low.

For the steel and bronze job the low-cost silver brazing alloy, which had been rejected for the bronze work, proved practical. Its higher melting point was needed because a full fillet was required.

A third solution had to be found for the stainless steel and steel job. In these cases, the nipple was brazed to the inner core with nickel silver. The collar was then brought into position behind this joint and silver soldered to the brain and the nipple. As a thin stainless steel collar is used, the necessary heat could not be applied to braze with nickel silver and successfully make it tin through the width of the collar and into the braid. For this reason the heavier brazing was done first and then the collar silver-soldered.

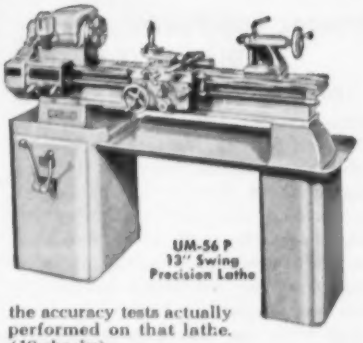
SHELDON Precision LATHES

for the size Lathes You Need Most

Sheldon lathes are built in the sizes you need most, for toolroom and production jobs. They are available with swings of 10", 11" and 13". . . in varying bed lengths with 18" to 48" center distances . . . and . . . in your choice of pedestal, cabinet or bench mountings.

Powerful, all-V-belt, drive units—either the standard 8-speed (or 16-speed) E-drive; or the production favorite, a rapid, lever-shift U-drive. Where higher spindle speeds are desired, the standard E-drive can be built to provide speeds up to 2,000 r.p.m.

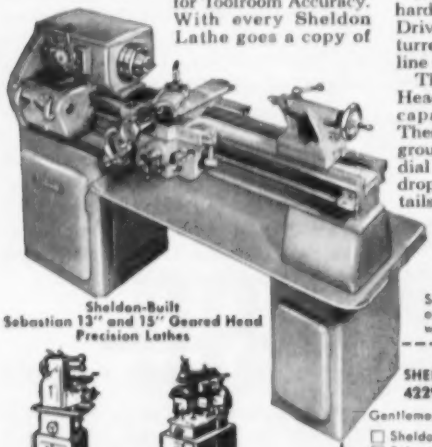
All Sheldon Lathes have handscraped, built-in precision. Each lathe is guaranteed to meet or surpass the American Standards for Toolroom Accuracy. With every Sheldon Lathe goes a copy of the accuracy tests actually performed on that lathe. (19 checks).



UM-56 P
13" Swing
Precision Lathe

Important optional features include: hardened bed ways, L00 Long Taper Key Drive spindles, 4" D1 Camlock spindles, bed turrets, taper attachments and a complete line of toolroom and production accessories.

The new Sheldon-built Sebastian Geared Head Lathes have greatly increased work capacity and many advanced features. These include a wide, heavy, hardened and ground bed . . . easy shifting spindle speed dial . . . 60-pitch gear box . . . independent drop lever apron clutches . . . cam-action tailstock clamp . . . and, automatic lubrication in the headstock and apron with "1-shot" lubrication of carriage.



Sheldon-Built
Sebastian 13" and 15" Geared Head
Precision Lathes

Send in coupon or write for catalogs and names of nearest Sheldon and Sebastian Distributors where you can see these new lathes in operation.

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Horizontal Milling Machine

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FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-5-158

GIANT CASTING FORMED IN SINGLE PIECE

This entire wafer valve disk, weighing 1701 lb, had to be cast in a single piece. To add to the problem, mid-portion of the valve was kept solid while the center of each side had to be cored. Metal sections or skins of the valve are ¾ in.

thick and are made of type 304 stainless steel. The valve, 48 in. in diameter, will be used in the circulating water system through which highly corrosive salt water passes. Stainless steel was specified to prevent corrosion which would hinder tight closure of the valve.

Casting was done by the Buffalo Foundry of Allegheny Ludlum Steel Corp. for the W. S. Rockwell Co.

ELEVATING EQUIPMENT HELPS BREAK BOTTLENECK

Temporary shut downs of can making machinery are no longer resulting in production bottlenecks at H. J. Heinz Co.'s plant at Pittsburgh. Now when such tie-ups occur and can filling equipment continues to call for cans, special Portelvators which have been waiting are placed just ahead of the can filling machinery.

In this position they feed a supplementary supply of cans into the conveyor system thus offsetting the can production loss.

Normally at the Heinz plant cans are fed directly from the can making machines into a conveyor system which delivers them to the can filling equipment. In order to achieve a balanced over all operation, can making capacity is tied in closely with can filling capacity. However, an out of round can passing through the can making machines can jam the operation and the system is shut down temporarily while the faulty piece is removed.

Over-all view of setup. Conveyor on floor picks up cans from hopper passing them overhead to filler machine.

In the past, two workers were required to feed supplemental supply of cans into the conveyor by hand to maintain flow of operations. Each of them averaged about 6,000 cans per hour as opposed to the 13,000 cans per hour handled by the new equipment. The Portelvator now in use has a table area of 693 sq in. It operates at a lift rate of 112 ipm from a minimum height of 24 in. to a maximum height of 40 in.

Cans are delivered from storage to the work station in such a manner that they are left stacked with tiers separated by paper sheets, ready for feeding into the conveyor. When required, the cans are slid onto the conveyor-feeding table by an operator using a wooden T. As each tier passes the electric eye the elevating mechanism is actuated, raising the table to the necessary height to bring another tier into feeding position.

Everyone working on design and performance problems of fast mechanical motion should have a copy of "High Speed Motion Pictures at the Service of the Engineer," a new booklet obtainable without charge from . . .

It tells about the new fast films for high speed movies and how various industries are using the Kodak High Speed Camera.

We'll also send, at your request and while the supply lasts, a copy of a booklet, "Bibliography on High-Speed Photography."

Kodak
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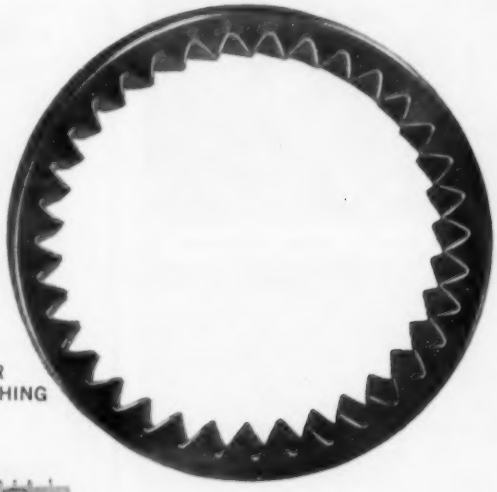
OSBORN BRUSHING METHODS worthy of your confidence

Automated finishing geared to your production

...at rates up to 300 pieces per hour

BEFORE BRUSHING



AFTER BRUSHING

THE automotive pump gears shown above are typical of a wide range of parts that can be precision finished with Osborn's line-production method.

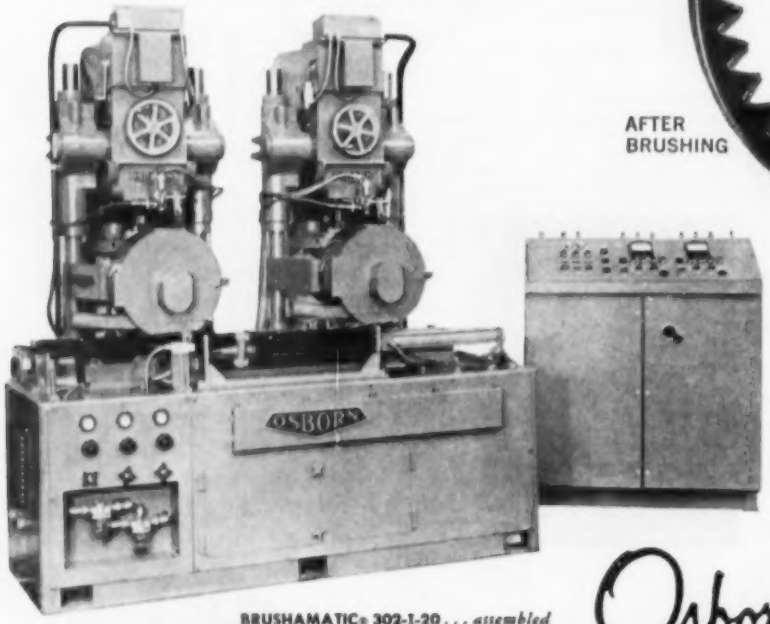
COMPLETELY INTEGRATED . . . Osborn's Automated Brushamatic® Equipment fits right into your production line.

ELIMINATES BOTTLENECKS . . . It is now possible to remove burrs, blend surface junctures, remove scale, clean parts on a continuous line-production basis.

AUTOMATES FINISHING OPERATIONS . . . Takes parts right from your production lines, feeds them to rotating power brushes, delivers them precision-finished to micro-tolerances where necessary.

. . . *all without manual handling*

Automated power brushing is just one example of the many ways Osborn is helping to improve production techniques. An **O**sborn **B**rushing **A**nalysis, made in your plant without obligation, may point out important benefits to your company. Write *The Osborn Manufacturing Company, Dept. K-34, Cleveland 14, Ohio.*



BRUSHAMATIC® 302-1-20 . . . *assembled from standard Brushamatic components which have been used in various combinations to fill a wide range of finishing requirements.*

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BRUSHING METHODS • POWER, PAINT AND MAINTENANCE BRUSHES • BRUSHING MACHINES • FOUNDRY PRODUCTION MACHINERY

TOOLS *of today*

Automatic Screw Machine

This automatic screw machine, called the No. 2, is available in three different capacities to take stock to ¾, 1¼ or 1½-in. diameter. For turning, forming, one-chip finishing, to 2½-in. length, or 3½-in. with lower driveshaft speed, the No. 2 will consistently hold limits to 0.0005 in. A range of 18 high spindle speeds is available on the ¾ and 1¼-in. spindle, and 16 speeds on the 1½-in.

spindle. Top speed is 5050 rpm on the ¾-in. capacity spindle; 3500 rpm on the 1¼-in. and 2450 rpm on the 1½ in. For each high speed, 11 or 12 low speeds can be used in combination, in ratios from 2.2:1 to 15:1.

Speed and direction of spindle rotation selected by set of 18 change gears. Selections of high spindle speed, low speed and direction of low to high speed are all made by simple pick-off gears located in a single compartment. Spindle driving chains and sprockets remain untouched.

Spindle has powerful, positive chain drive at all speeds. Insures delivery of required power throughout the full-speed range for all operations within the tool capacity of the machine. Spindle is removable-unit, full antifriction bearing type, controlling end and radial play to the absolute minimum.

Production rates range from 1 2/3 to 480 sec. per piece and are obtained by 11 change gears. When operations required to produce the part permit, more than one piece per cycle can be made.

Vertical slide has a quick-acting tool clamp, which holds the cutoff tool and frees a cross slide for additional tooling.

Positive stopping device can be set to automatically stop the driveshaft when the last piece in the bar is completed. A light indicates when the machine is not producing.

Rapid pull-out mechanism, incorporated with the turret permits the drill to be withdrawn several times to clear the hold during deep drilling work, and returned to drilling position in ½ sec. without turret indexing.

Control panel has "start" and "stop" buttons for spindle, and "start" "stop" and "jog" buttons for driveshaft.

A spring safety device in the stock feeding mechanism prevents breakage in case of interference with the advance of the feed tube. If tool slide mechanisms are subject to excessive stress, power to the driveshaft is automatically shut off. An interlock assures proper mounting of the driveshaft gears.

Brown & Sharpe Mfg. Co., Providence 1, R. I.

T-5-1

Standardized Honing Machine

Designed to bridge the gap between the large mass producer's needs and those of the small shop, the honing machine, designated the 150, is offered as a basic unit to which standardized packaged additions may be made to provide an automated machine. The initial machine incorporates automatic stroking, with stroking controls along with its basic standard equipment. The additional optional equipment includes Microdial automatic hydraulic feed and stonewear compensation, automatic stonewear indicator and controls (used with Microdial), automatic coolant separator, pump and tank, automatic sizing control to suit application, which can be added at any time.

Built as a horizontal type machine with a stationary bridge to accommodate work fixtures and optional equipment, this design facilitates addition of

automatic work handling devices, and also simplifies changeovers from one job setup to another. The spindle is mounted on a reciprocating carriage, hydraulically actuated, while the adjusting head is manually operated.

The machine has a 12 in. stroke and 1½ in. work diameter capacity. Because of the standard basic design, special engineering is limited to fixturing and tooling. Spindle rotation speed derives from an adjustable speed drive; reciprocation speed range is from 0 to 60 fpm.

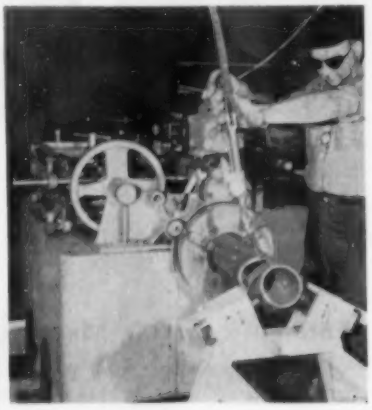
Particularly developed to meet needs of smaller manufacturers, the machine is also practical for larger producers who have short production runs or need for standby equipment. It can be partially or fully automated by addition either or both standard package units: the automatic feed package, which includes an automatic stone wear indicator and compensator; the automatic sizing package, either gage plug or gage ring type.

Micromatic Hone Corp., Detroit, Mich. **T-5-2**

Pipe Cutting Machine

No cams, patterns or templates are required by this oxygen-flame pipe cutting machine which automatically generates, cuts, bevels and properly contours pipe joints with precision for any given angle of intersection.

The tool, called a Mechanical Draftsman, required only three settings to



conform to the ID of the pipe being cut, the OD of the pipe being intersected, and the angle of intersection. The resulting cut is mathematically precise and requires no further preparation before welding. A fourth adjustment is provided for pipe intersections having offset center lines.

In the illustration, an operator at Martin Co. is completing a 90-deg saddle cut. The Mechanical Draftsman can make both cuts simultaneously with one revolution of the pipe.

Steffan Engineering, Salem, Ohio. **T-5-3**

Speed Production and CUT COSTS!

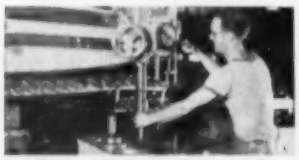
Multiple tool jobs become continuous with

McCROSKY Wizard® QUICK-CHANGE CHUCKS and COLLETS

holds tools rigidly and centered

There's no stopping — or even slowing down the spindle for tool changes when you use Wizard Quick-Change Chucks and Collets. To release the tool the operator simply grips the chuck lightly with his thumb and forefinger, and the collet drops out into his hand. The next tool and collet is then pushed up into the revolving spindle;— is centered automatically;— and locked rigidly in position;— speeding up production and cutting costs. Try Wizard Chucks and Collets once and you'll never be without them. Furnished in four sizes. Write for a fully descriptive catalog today!

Disengaging Wizard Collet with Drill from Wizard Chuck.



Wizard Equipment being used with Radial Drill.

Wizard Equipment on Multiple Operation Job.

The complete McCrosky line includes:

Jack-Lock® Milling Cutters — Wizard® Quick-Change Chucks
Super® Adjustable Reamers — Block Type Boring Bars
Turret Tool Posts — Specially Engineered Multiple Operation Tools

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McCROSKY TOOL CORPORATION
MEADVILLE, PA.

Engineering and Sales Representatives in the Principal Cities
FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-5-162

USE READER SERVICE CARD ON PAGE 169 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

Deburring Machine

Two-station Burr-Master deburring machine for the functional chamfering of hidden holes, countersinks 20 blind holes on an internal diameter of a stator-blade piston for an automatic transmission. Although work holding fixtures for this job are necessarily custom tailored, the machining principle is applicable to many similar automotive and aircraft parts.

The chamfering operation permits clearance for a mechanical valve in each hole. Parts are semiautomatically positioned on the work spindle and wedged, then manually clamped. Central and radial locations of the workpiece are taken from predrilled holes. The rotary burr tool is brought into

contact at 90 deg. to the work. The piece is automatically indexed for the complete work cycle. Production rate from both stations is 200 parts an hour for this application.

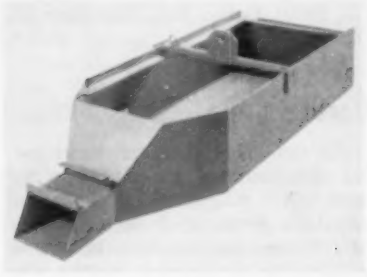
An electric clutch stops the machine with both cutters withdrawn for loading and unloading. Separate 1 hp, 1200 rpm, 220-440 vac motors and controls are supplied for each work station for maximum flexibility in operation.

Modern Industrial Engineering Co., 14230 Birwood Ave., Detroit 38, Mich.

T-5-4

Hoist Pans

Loading of chips and other media are expedited by these welded steel pans, available in four sizes ranging in capacity from 4 to 14 cu ft. Fabricated from 10-ga sheet steel, all are fitted with either rollers or roller-bearing

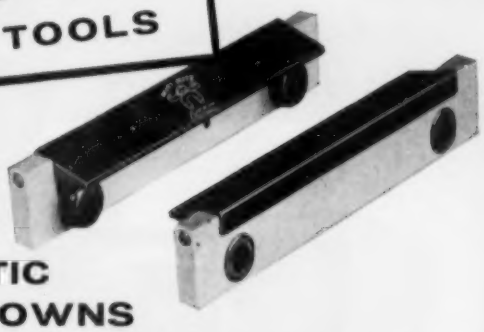


wheels. Balanced yoke at top provides for crane or hoist hook.

Model 4, with capacity of 4 cu ft, will hold a load up to 500 lb of fused aluminum oxide chips. The pan is 43 in. long, 24 in. wide and 13 in. high. Model 6.5, capacity 6.5 cu ft, will hold a load up to 800 lb of fused aluminum oxide chips. Its length is 65 in.; width, 19 in.; height, 15 in.

Model 11, capacity 11 cu ft, will hold

NEW LUFKIN TOOLS



MAGNETIC HOLD DOWNS

A new, time-saving idea in hold downs — faster, easier and more convenient. Attaches instantly and holds to vise jaws in any position without use of shims, blocks or parallels.

Clamping edge is 3/32", will hold very thin work. Backs are tapered, forcing the work downward as the vise jaws close. A flat spring tab keeps the hold down in a horizontal position until pressure is applied.

MAGNETIC BASE HEAVY DUTY Surface Gage

A large, rugged surface gage and indicator holder. Increased base size prevents rocking . . . larger, stronger magnets permit use with lug back and other heavy indicators and attachments.

The two heavy duty magnets recessed into the solid aluminum base are completely isolated from the spindle and other parts to avoid transmission of the magnetic pull. Polarity of the magnets is controlled by a king size on-off switch that turns the magnetic pull to full on . . . full off . . . or to any intermediate point to make minor adjustments in position. Ground and lapped, contact face has a V-groove, adapting it for use on cylindrical surfaces.

New design scriber has a removable, long-wearing carbide tip which can be reversed to protect the tip from damage when not in use.

Rugged, rocker arm and large diameter fine adjustment screw permit final, precise adjustments. 9" and 12" spindles, swivel indicator attachment, indicator holding rod, and scriber with reversible carbide tip are included. 18" spindle also available.

MITI-MITE MAGNETIC BASE TOOLS CATALOG

Send for this new 12 page illustrated catalog today. Contains full information on the complete Lufkin line of magnetic base tools.

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Why NEW "150" HYDROHONER Is Economical . . . Compact . . . Standardized

Basic Micromatic "150" Machine, suitable for both internal and external Microhoning.

Now, even manufacturers with limited capital can afford Microhoning . . . with all its benefits including efficient stock removal, accurate geometry and controlled surface finish. The new Micromatic "150" Hydrohoner is the answer!

Because it is standardized and produced in quantity, this quality machine is economical. (Special engineering is limited to tooling and fixturing.) The design and quality of the "150" assures performance equal to more expensive honing machines. It has a 12" stroke and Microhones diameters up to 1½" . . . yet requires just 34" x 52" of floor space.

The Micromatic "150" is ideal for the manufacturer with limited capital, short production runs or a need for standby equipment. Immediate delivery from stock on basic machines.

The principles and application of Microhoning are explained in a 30-minute, 16mm, sound movie, "Progress in Precision"... available at your request.

☐ Please send me "Progress in Precision" in time for showing on _____(date).
☐ Please have a Micromatic Field Engineer call.
☐ Please send Microhoning literature and case histories.

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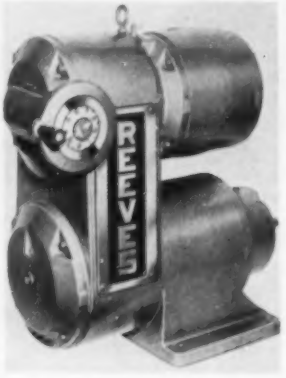
FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-5-164

a load up to 1400 lb of fused aluminum oxide chips. Length is 81 in.; width, 27 in.; height, 14 in. Model 14, capacity 14 cu ft, will hold a load up to 1800 lb of fused aluminum oxide chips. Length is 81 in.; width, 33 in.; and height, 14 in.

Lord Chemical Corp., York, Pa.
T-5-5

Motor Drives

Vari-Speed Motodrives offering high operating efficiency and extended ratios of speed adjustment, are offered in integral horsepower ratings up to 5 hp. Each size is available in standard assemblies tailored to fit a wide range of space requirements. Many motor and



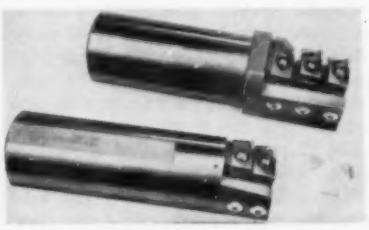
mounting modifications, as well as remote control features, are available for unusual installation requirements.

The units are useful as tools of automation when used with automatic control systems and such available accessories as magnetic brakes and tachometers.

Reliance Electric and Engineering Co., 24701 Euclid Ave., Cleveland 17, Ohio. **T-5-6**

Boring Bar

The combining of multidiameter boring operations and chamfering in the same tool is simplified with the micro-adjustable boring tools in this boring bar. Throw-away inserts requiring no grinding are used in each location. The anvil on which each insert is locked is positively adjustable in and out. Each



division of the screw-dials represents 0.001 in. on diameter. Once set on the job, the anvils on bars require no adjustment. When inserts are dull, they are indexed to an unused edge or interchanged.

These boring bars may be used on all types of horizontal or vertical turret lathes.

Wesson Co., 1220 Woodward Heights Blvd., Ferndale 20, Mich. **T-5-7**

USE READER SERVICE CARD ON PAGE 169 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

Plastic Dispenser

This low-cost, portable metering device accurately pumps and delivers exact quantities of epoxy and polyester resins and hardeners for application in fiber glass fabricating operations.

By dispensing only the desired quantities of material at one time, there is no waste. It will deliver as little as 10

grams of materials. Maximum output is 3 lb per minute. It is simple in operation with little or no maintenance required. Material is fed to the plastic dispenser directly from drums or containers through hoses.

Auto-Air Industries, Inc., P. O. Box 2166, E. Michigan Ave. Branch, Lansing 12, Mich. **T-5-8**

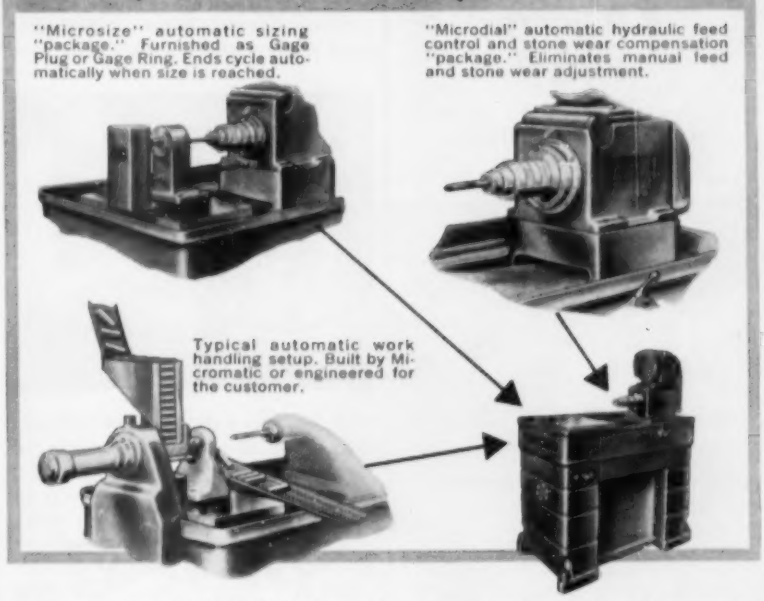
Mill Regulator

Dual-circuit, adjustable-speed electronic mill regulator, designated VSMR, is available for application in high-performance, continuous-process mills.

Basically, the unit operates on two sets of output thyratron tubes operating in parallel. Each set of tubes is capable of handling the output load without exceeding the tube rating. In normal operation, the tubes tend to share the load, but in case of tube failure in one half of the regulator, the two tubes in the operable half instantly and automatically carry the entire load.

Because of these thyratron tubes there

How NEW "150" HYDROHONER Can Be Automated to Any Degree . . . Easily . . . Economically


"Microsize" automatic sizing "package." Furnished as Gage Plug or Gage Ring. Ends cycle automatically when size is reached.
"Microdial" automatic hydraulic feed control and stone wear compensation "package." Eliminates manual feed and stone wear adjustment.
Typical automatic work handling setup. Built by Micromatic or engineered for the customer.

The basic Model "150" Hydrohoner is a new, standardized and economical Microhoning machine . . . priced for manufacturers with limited capital or relatively short production runs.

The basic machine features automatic stroking and hydraulic initial tool expansion and collapse. Various degrees of automation can be easily added at any time to the basic machine as required by individual manufacturers' needs. Micromatic "package units" which provide specific automation functions are illustrated. Design of this basic horizontal machine and its stationary bridge facilitate addition of these "package units". For complete automation of the "150" Hydrohoner, Micromatic will build automatic work handling devices or assist users in designing their own automation of work handling.

Send coupon for complete information.

Learn how Microhoning will give efficient stock removal, closer tolerances, accurate alignment and functional surfaces.

☐ Please have a Micromatic Field Engineer call.
☐ Please send Micromatic literature and case histories.

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MICROMATIC HONE CORP.
8100 SCHOOLCRAFT AVENUE · DETROIT 38, MICHIGAN

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-5-165

The Drill Sarge says . . .

"New York Twist Drills K.O. more rivets!"

New York's "Knockout" Drills extra tough for one of Aircraft Industry's toughest assignments

Aircraft modification requires removal of thousands of rivets and these Knockout Drills remove more of them per minute—another new development by the engineers of New York Twist Drill Company. They're made for aluminum as well as titanium and stainless steel, and aircraft plants report an improvement of almost two to one over drills formerly recommended for the job. So do trailer companies with similar operations.

Extra smooth flutes and accurate points on New York drills improve drilling performance in all tough metals and plastics, **and you save 20% on your twist drill bill!** New York drills last longer and you get more holes, all perfectly round and exactly on size without burrs on the break through. Split points at no extra charge, aid in biting in.

THESE NEW YORK DRILLS ALWAYS IN FINISHED STOCK
. . . All popular aircraft sizes, in standard lengths and aircraft extension, 6" and 12"

Write now for catalog, technical manual and net prices

NEW YORK TWIST DRILL COMPANY, INC.

EASTERN HEADQUARTERS:
278 Lafayette Street, New York 12, N. Y.
MIDWESTERN HEADQUARTERS:
30-A North Clinton Street, Chicago 6, Ill.

INDICATE A-5-166-1

is no need for circuit tuning and matching. The output section will operate into the motor field or the generator field of any drive to accurately control speed, tension and voltage, within the rated limit of a single pair of tubes. The regulators are available in both 6 and 10-amp outputs, based on the capacity of one set of output tubes.

Sealpaks, which are complete, special-purpose electronic circuits imbedded in solid blocks of resilient plastic resin, are

used throughout the regulator construction, so that all resistor components are completely protected against vibration, moisture or contaminants. They may be quickly checked with a voltmeter to determine serviceability and are easily replaced.

Reliance Electric and Engineering Co., 24701 Euclid Ave., Cleveland 17, Ohio. **T-5-9**

Contact Wheel

This rubber contact "X" wheel, for use on backstand grinding and polishing operations, is made with a slashed serration. The wheel, made by Chicago Rubber Co., Waukegan, Ill., is formed from neoprene that is substantially

more abrasive-resistant than previously-used rubber compounds. An improved flange construction prevents mis-seating the flange, because it is an integral part of the wheel and is permanently attached to the hub.

Because of the new type of serration, the wheel has unusually wide lands providing more rubber surface for longer wear, but with no sacrifice of

NEW from CRAFTS

Versatile "lay away" clamped-on carbide circular form tool

Replacement costs and delays vanish with Crafts rugged, heat-treated alloy steel Tool Holder. Can be used over and over again for any number of different contours on B & S #00, #0, #2 machines.

Simply order our interchangeable carbide tips optically ground to your specifications. In stock for immediate delivery.

Diamond Dressers

Diamond Tools

Carbide Gages

Special Carbide Tools

Send Today for FREE CATALOG "Complete Carbide Tooling for Automation". Describes Crafts' newest time and money-saving contributions to the tooling field.

Arthur A. CRAFTS Company, Inc.
601 Newbury Street
Boston, Mass.

CRAFTS
Chicago
Detroit
Philadelphia
Bristol, Conn.

INDICATE A-5-166-2

conformability or aggressiveness. The wheel leaves no mark on the workpiece.

The X wheel is available in a 14-in. diameter with 1, 2, 3 and 4-in. face widths, and in several durometers. However, 80, 55, 35 and 20 durometers are considered suitable for most applications.

The wheel's 11-ga steel hub minimizes possibility of in-transit or in-plant damage.

Minnesota Mining & Mfg. Co., Dept. F7-54, 900 Fauquier St., St. Paul 6, Minn. **T-5-10**

Finishing Barrel

This finishing barrel, which offers adjustable speeds, has a 22x33-in. barrel of welded steel plate with a capacity of 1,200 lb. Available in either single or double compartment units with or without neoprene linings, the barrel operates at a speed of from seven to 30 rpm. Safety devices and controls incorporated in the machine include a poppet type venting valve, a guard which functions as an automatic cut-off switch when raised, and recessed controls.

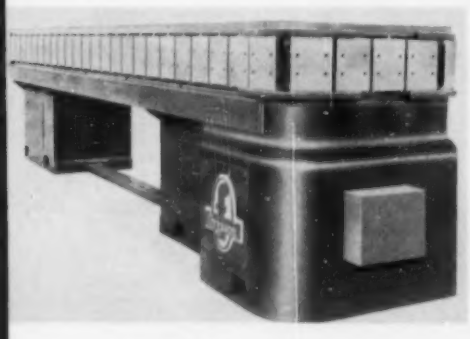
The Abbott Ball Co., Hartford, Conn. **T-5-11**

USE READER SERVICE CARD ON PAGE 169 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

Transfer Machine Bases

Standard Trans-O-Mator straight line transfer machines for automatic machining and assembly have been redesigned and are available with strokes of either 6, 8, 12, 16, or 24 in. and with a choice of two types of carriers in various sizes. Standard lengths are 10, 14, and 18 ft.

Carrier chain tension can be adjusted by either a screw take-up method, whereby tightening a single screw moves an entire end section of the upper frame, or by a spring-mounted mechanism that automatically compensates for chain stretching. The power section, composed of a standard 2-hp gear motor, electric clutch-brake combination and cam indexing mechanism is mounted as a single unit and can be easily removed from the machine.



Standard control panel contains an electrical interlock between the indexing and tooling power supply as well as start, stop and jog controls, indicator lights and provisions for automatic scanning devices. The panel permits either adjustable timer-controlled cycle or sequential operation of tooling and transfer movement.

Roller Gear Div., Ferguson Machine Corp., P. O. Box 5841, St. Louis 21, Mo. **T-5-12**

Tapping-Drilling Machine

Tapping is combined with drilling and reaming in this 4-post machine previously designed for the latter operations only.

The drill head with its contingent fixturing can be removed, for example, to accommodate a lead screw tapping head. Small production runs with changeable hole patterns can be economically tooled.

The 4-post principle involves a hydraulically-actuated ram which raises the work and feeds it into the rotating

YOU CAN

Hold it...

Concentric within .001" with

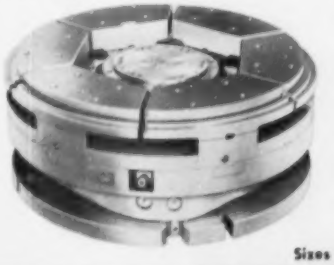
SPEEDGRIP "Cyl-Chucks"

Photo courtesy of I-T-E Circuit Breaker Company

Self-Contained Production Tools for Holding Jet Engine or Other Thin-Walled Parts

SELF-CENTERING "CYL-CHUCKS"

Designed primarily for second operation chucking on finished or semi-finished surfaces. Hold part concentric within .001" for boring, turning, or grinding operations. IMPROVES QUALITY — INCREASES PRODUCTION UP TO 70%.



COMPENSATING "CYL-CHUCKS"

This compensating chuck is made for first operation work to hold rough castings and forgings while boring, turning, or grinding. Special feature provides (12) or more equally spaced, equalized pressure points to practically eliminate distortion.

Sizes 24" to 72"

Write for Bulletin No. 23 for full description and technical details.

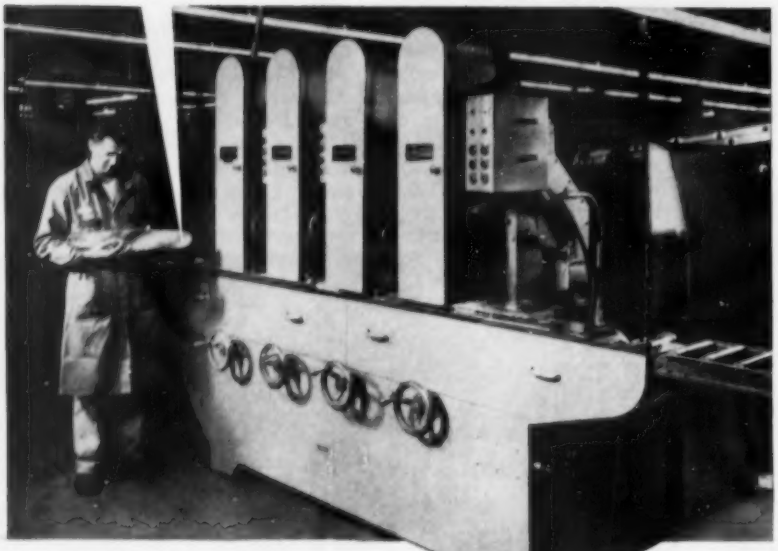
SPEEDGRIP CHUCK

Division of ERNEST, HOLDEMAN & COLLET, INC.

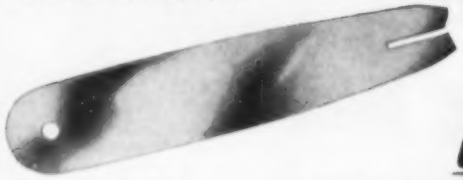
Elkhart, Indiana.

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-5-167

HOLDS .001" TOLERANCES BETTER THAN OTHER GRINDERS TESTED... COSTS LESS: PRODUCES MORE



Engelberg's 4-Head, Conveyor-Type, Abrasive Belt Grinder in Operation at Oregon Saw Chain Corporation



Finished to .001" T.I.R. in one pass by Engelberg 4-head, conveyor-type, abrasive belt grinder.

ACTUAL TESTS PROVE PRODUCTION PERFECTION

After a nationwide tour testing grinders of various makes and kinds, the Oregon Saw Chain Corporation bought an Engelberg #680, 4-head abrasive belt grinder. Improvements in product and production have more than offset the investment, the Company says.

The Engelberg #680 provides through-feed as against the reciprocating feed of the surface grinder. It produces continuously with no down cycles for loading and unloading. And it holds a total-indicator-reading tolerance of .001", better than any other grinder tested. Rejects run less than 1%.

Chain saw bars, heat treated to 42 Rockwell "C" hardness, are finished in one pass. Normal operation calls for the removal of .005" by the four heads at a rate of 10'/min.

ENGELBERG Abrasive Belt Grinders

are available with 1 to 6 grinding heads. Send a sample part for cost-and-time-savings estimate... or an Engelberg Production Engineer will be glad to call. No cost. No obligation.

ENGELBERG

HULLER CO., INC.

305 Seneca St., Syracuse, N. Y.

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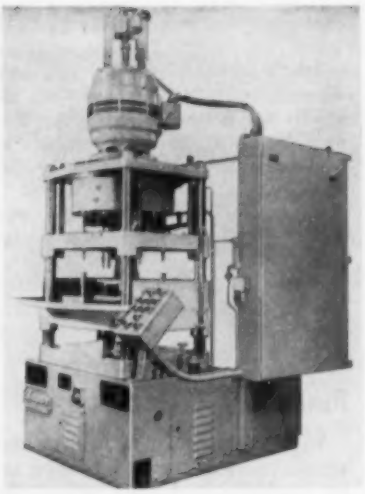

spindles of the head. All holes are machined simultaneously. Holes as close as the sum of the hole diameters can be drilled or tapped. This machine is standardized in the 32-in. size.

Zagar, Inc., 23892 Lakeland Blvd., Cleveland 23, Ohio. **T-5-13**

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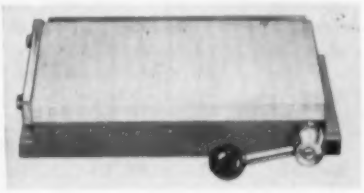
Magnetic Chucks

These Multi Pole fine division permanent magnetic chucks have characteristics equal to those of electromagnetic chucks. This has been accom-



plished largely by the use of ceramic magnetic material.

The line currently is being made in three sizes: 6 x 10½ in., 6 x 12½ in., and 6 x 18½ in., with heights of 2⅛ in., 2⅛ in. and 2⅜ in. respectively.

O. S. Walker Co., Inc., Worcester, Mass. **T-5-14**

Pressure Blasting Unit

The Clemco wet hone machine, called Lik-Wid hone, is designed so that pressing a button starts the agitation of the slurry immediately regardless of how long the machine has been standing idle. Any abrasive can be used from 30 to 500 mesh. Cleaning, deburring, honing or polishing operations are ac-

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TRADE LITERATURE CURRENTLY OFFERED BY THE TOOL ENGINEER ADVERTISERS

Literature Number	COMPANY	DESCRIPTION
A-5-316	Allegheny Ludlum Steel Corp.	**Tool Steels**—"Forging and Casting Products" contains the latest information on FCC Air Hardening, Oil Hardening and other Cast-to-Shape Tool Steels. (Page 316)
A-5-13	American Drill Bushing Co.	**Drill Bushings**—Catalog contains data on bushings and 3-D method of ordering. (Page 13)
A-5-12	The American Tool Works Co.	**Radial Drills**—Bulletin No. 325 describes features of "American" Hole Wizard. (Page 12)
A-5-332	Ampco Metal, Inc.	**Material**—Ampco semifinished machined stock bars described in catalog. (Page 332)
A-5-219	F. E. Anderson Oil Co., Inc.	**Coolants**—Sixteen-page booklet describes coolant dilutions and problems. (Page 219)
A-5-208	Armstrong-Blum Mfg. Co.	**Saws**—Bulletin GP35 describes and illustrates Marvel No. 4B High-Speed Hack Saw. (Page 208)
A-5-233	The Atrax Co.	**Cutting Tools**—Catalog lists more than 850 standard carbide burs by Atrax. (Pages 232-233)
A-5-340	Balas Collet Mfg. Co.	**Attachments**—Catalog contains data on Balas pushers and feed fingers. (Page 340)
A-5-286	Barksdale Valves	**Air Valves**—Bulletin A-5 contains data on 4-way valves for 240 psi. (Page 286)
A-5-243	The Bellows Co.	**Cylinders**—"Story of the Bellows Air Motor" described in Bulletin BM-25. (Page 243)
A-5-279	Brown & Sharpe Mfg. Co.	**Screw Machines**—Form No. S25 contains data on new B&S No. 2 automatic. (Pages 278-279)
A-5-251	Cadillac Gage Co.	**Gages**—Catalog contains data on Cadillac Pla-Chek gage (Page 251)
A-5-294-2	Central Safety Equipment Co.	**Die Accessories**—For complete information on Elasticones, request Bulletin 53. (Page 294)
A-5-339-2	Chaso Tool Co., Inc.	**Die Heads**—Catalog contains information on Chaso cutting and chasing dies. (Page 339)
A-5-245	Chicago-Latrobe	**Cutting Tools**—Catalog contains listings and technical information on end mills. (Page 245)
A-5-241	The Cincinnati Shaper Co.	**Shears**—Catalog B-4R and Catalog S-7R describe the Cincinnati Shear and press brake. (Pages 240-241)
A-5-166-2	Arthur A. Crafts Co., Inc.	**Carbide Form Tools**—Catalog available on "Complete Carbide Tooling for Automation." (Page 166)
A-5-286-3	Cramer Posture Chair Co., Inc.	**Chairs**—Catalog describes Cramer Hi-Model chairs for working architects and engineers. (Page 286)
A-5-303	Crane Packing Co.	**Lapping**—Folder contains data on producing precision flatness. (Page 303)
A-5-50	Delta Power Tool Div., Rockwell Mfg. Co.	**Lathe**—Delta 11-in. metalworking lathe described in industrial catalog. (Page 59)
A-5-230-2	Detroit Stamping Co.	**Fixture Components**—De-Sta-Co clamp with trigger release described in catalog. (Page 230)
A-5-202	Diamonite Products Mfg. Co.	**Cutting Tools**—Catalog contains feed and speed chart for use with Diamonite Oxide Cutting tools. (Page 202)
A-5-310	The DoAll Co.	**Band Saw**—Engineering applications described in band saw catalog and new Contour-matic catalog. (Page 310)
A-5-299	Dumore Co.	**Grinders**—Catalog 55 FL describes Dumore tool post engineers. (Page 299)
A-5-15	Federal Products Corp.	**Indicators**—Operational data for dial indicators and gages contained in catalog. (Pages 14-15)
A-5-18	Gisholt Machine Co.	**Lathes**—A preventive maintenance chart is now available for both ram type and saddle type turret lathes. (Page 18)
A-5-322	George Gorton Machine Co.	**Milling Machines**—Gorton Mastermil described in Bulletin 2699-A-2605. (Page 322)
A-5-199	Hammond Machinery Builders, Inc.	**Tool Grinders**—Catalog contains data on new electrolytic oscillating carbide tool grinder. (Page 199)

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Literature Number	COMPANY	DESCRIPTION
A-5-26	Handy & Harman	**Brazing**—Bulletin 20 gives facts on Easy-Flo applications. (Page 26)
A-5-156	Heinrich Tools, Inc.	**Machine Components**—Catalog contains engineering applications of Heinrich Grip-Master vises. (Page 156)
A-5-295	Jones & Lamson Machine Co.	**Comparators**—Catalog 402-C describes Jones & Lamson optical comparators. (Page 295)
A-5-176	Kearney & Trecker	**Special Machine**—Data Sheet No. 1080 contains engineering details on K & T's automatic transfer machine. (Page 176)
A-5-266-1	Louis Levin & Son, Inc.	**Lathes**—Catalog M describes line of instrument lathes, micro-drilling equipment and accessories. (Page 266)
A-5-298	Lodge & Shipley	**Shears**—Lodge & Shipley speed shears described in Bulletin No. PS-12. (Page 298)
A-5-163	The Lufkin Rule Co.	**Scribers**—Catalog contains information on complete Lufkin line of magnetic base tools. (Page 163)
A-5-162	McCrosky Tool Corp.	**Machine Attachments**—Catalog contains data on milling cutters, reamers, tool posts, quick-change chucks, boring bars, and special multiple operation tools. (Page 162)
A-5-45	The McKay Machine Co.	**Roller Levelers**—Bulletin 100 describes McKay application for roller levelers. (Page 45)
A-5-262	Metal Cutting Tools Inc.	**Cutting Tools**—Illustrated brochure gives specifications of new Metcut Pin-Mount design core drill. (Page 262)
A-5-293	Mohawk Tools, Inc.	**Cutting Tools**—Illustrated brochure describes subland versus step tool operations. (Page 293)
A-5-229	The Morris Machine Tool Co.	**Special Machine**—Literature outlines mass-production problems involving drilling in related operations for Morris Air-Oil-Matic drill units. (Page 229)
A-5-43	The National Acme Co.	**Automatics**—Catalog DT-52 contains data on Vers-O-tool threading and hollow milling heads. (Page 43)
A-5-239	National Tool Co.	**Special Tools**—Catalog shows National Tool Co.'s complete line of special tools for the metalworking industry. (Page 239)
A-5-166-1	New York Twist Drill Co., Inc.	**Cutting Tools**—Specifications and prices contained in catalog. (Page 166)
A-5-291	Northwestern Tool & Eng. Co.	**Fixture Components**—Brochure contains tracing templates for toggle shoe clamps. (Page 291)
A-5-273	Ortman-Miller Machine Co.	**Cylinders**—Bulletins 101A and 105 describe removable rod gland cartridge exclusive with the 0-M series TH hydraulic cylinder. (Page 273)
A-5-250-3	Petz-Emery Inc.	**Indicators**—Catalog D describes En-re line of dial indicators. (Page 250)
A-5-10	The Producto Machine Co.	**Die Set**—Eight-page quarterly contains data for designers, makers and users of dies. (Page 10)
A-5-325	Putnam Tool Co.	**Cutting Tools**—Catalog 457 contains information on Putnam end mills for aluminum. (Page 325)
A-5-222-1	Ruthman Machinery Co.	**Pumps**—Catalog describes Ruthman line of gusher coolant pumps. (Page 222)
A-5-266-2	George Scherr Co., Inc.	**Microscopes**—Interchangeable dial templets and oculars of new toolmakers microscope described in catalog Code YGIIQ. (Page 266)
A-5-211	Seibert & Sons, Inc.	**Drill Spindles**—Folio 1-50 illustrates complete line of Seibert multiple drill spindles. (Page 211)
A-5-280	The Skinner Chuck Co.	**Power Chucks**—Skinner "Junior" power chucking unit described in special bulletin, JP67. (Page 280)
A-5-167	Speedgrip Chuck, Div. of Ernest, Holdeman & Collet, Inc.	**Power Chucks**—Bulletin 23 describes Speedgrip "Cyl-Chucks." (Page 167)
A-5-193	Standard Die Set Mfrs., Inc.	**Die Sets**—Die set data in comparison chart contained in booklet. (Page 193)
A-5-195	Standard Gage Co., Inc.	**Indicators**—Bulletin describes Check Master test indicators. (Page 195)
A-5-250-2	P. A. Sturtevant Co.	**Torque Wrench**—Manual contains formula tables and explanations for correct use of adapters and extensions. (Page 250)
A-5-331	Super Tool Co.	**Cutting Tools**—Catalog contains data on solid and carbide tip tools. (Page 331)

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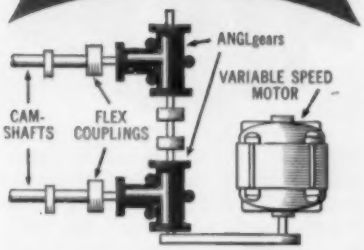
ANGLgear solves timing problem



Drawing based on actual installation shows ANGLgear drives for camshafts on Herb-Shelly bagmaking machine. ANGLgears provide positive power transmission; assure correct timing of cam action.

A producer of polyethylene packaging, Herb-Shelly, Inc., Farmington, Minn., designs and builds much of its own production equipment.

One machine, an automatic bagmaker, required 90° power takeoffs to drive its two parallel camshafts. Chains and sprockets were rejected because even the slightest backlash would have affected timing. Miter gears were used instead. However, they failed repeatedly under the constantly fluctuating load imposed by the cams.

Finally, Herb-Shelly installed two standard ANGLgears. Result: the ANGLgears not only provided the positive, precision drive essential for accurate timing, but also, unlike previous bevel gears, had the stamina to absorb the continuous variations in load.

Perhaps ANGLgear can solve a similar 90° drive problem for you. ANGLgears are available from stock in 3 sizes; 12 models.

See our literature in Sweet's Product Design File; then contact your local distributor or write direct.

AIRBORNE®

AIRBORNE ACCESSORIES CORPORATION

HILLSIDE 5, NEW JERSEY

INDICATE A-5-171-1

complished by reducing or increasing pressure on the pressure regulator valve and using an appropriate abrasive.

Wide window of the foot-controlled washer provides good visibility. Drain, plus pump action, cleans unit in min-

utes. Installation consists of attaching a 1-in. air line and ½-in. water line, plus 220-v, 3-phase and 110-v electrical connection.

Clementina Ltd., 2277 Jerrold Ave., San Francisco, Calif. **T-5-15**

Soldering Machine

In this basic automatic soldering machine, called Braze-O-Matic, solder is fed automatically through magazines to preheated parts for solder fabrication. A timing mechanism operates and regulates the flame and the precise amount of solder in connection with an index

Special Size Reamers ARE STANDARD WITH L&I

TWO MORE L&I EXCLUSIVES ...AT NO EXTRA COST!

DOWEL PIN REAMERS

Straight Shank, Right Hand Cut with Straight, Right or Left Hand Spiral Flutes.

14 Sizes from .1230 thru .4995" Sets, tool

OVER & UNDER SIZE CHUCKING REAMERS

Straight Shank, Right Hand Cut with Straight, Right or Left Hand Spiral Flutes.

14 Sizes from .124 thru .501" Sets, tool

These reamers are two more reasons why L&I is the source for a **complete** reamer line.

See your L&I Distributor.

L&I

"the reamer specialists"

LAVALLEE & IDE, INC.

CHICOPEE, MASS.

INDICATE A-5-171-2

table. It localizes the heat at the point of fabrication in the same manner as it would be done manually. Result is high quality soldering at a high production rate.

The equipment works equally efficient with all forms of soldering and all types of metals. A signal system informs the operator of the need for replenishing the supply of soldering materials in the machine with sufficient lead time to avoid delay or down time.

Castle Machines, Inc., Dept. TE, Erie, Pa. **T-5-16**

Induction Heating Unit

A 400-cycle Hobart induction type heating unit, used in conjunction with welding operations, permits preheating and stress relieving to be carried out in one continuous cycle. This instrument is adjustable to any desired schedule of heating, soaking, and cooling rates, and, when preset to a particular program, provides fully automatic and continuous control of temperature during processing.

When the preheat temperature has

been selected, the controlling instrument heats to that temperature and holds it accurately until welding begins. After the weld is completed, the instrument automatically starts the desired stress-relieving program. During this time, only enough heat is added to meet exact specifications. A permanent, accurate record of the entire program is provided on the instrument chart, allowing efficiency and usage calculations to be made as desired.

Hobart Brothers Co., Troy, Ohio. **T-5-17**

Now A COMPLETE LINE of the Revolutionary New

Webber OPTICAL HEIGHT GAGES

25" - 37" - 49" - 61"

Combining two proven principles of precision measurement – WEBBER Gage Blocks and the Leitz Measuring Microscope –

THE WEBBER OPTICAL HEIGHT GAGE has made it possible, for the first time, to make measurements in millionths, up to a full 61" of height. Its fantastic accuracy is maintained throughout the entire length of the instrument, ± .000005" per inch of length.

Simple to use, fast, accurate, the WEBBER Optical Height Gage introduces a new "era of manufacturing accuracy. The saving of time, the accelerated rate of production, and the resultant increased profits make it vitally important that every manufacturer who is conscious of today's trend toward even greater precision get the facts about this revolutionary new measuring instrument.

Your inquiry is invited.

Webber GAGE CO.

12908 TRISKETT RD. CLEVELAND 11, OHIO

LARGEST EXCLUSIVE MANUFACTURERS OF PRECISION GAGE BLOCKS

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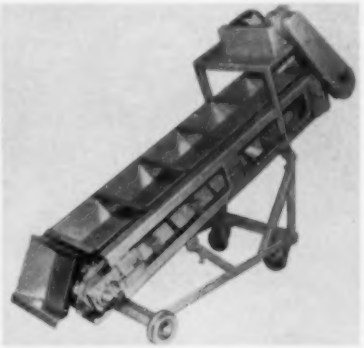
USE READER SERVICE CARD ON PAGE 169 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

Troughing Conveyor

Used for conveying liquids, chips, scrap, stampings, hot and cold forgings, castings, sand, grain, chemicals or powder, this metal troughing conveyor uses no hinges. Corrosive material can also be conveyed through the device by



using stainless steel troughing buckets.

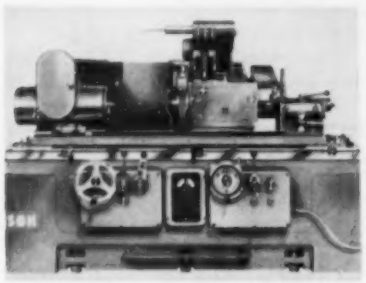
Length, width, shape can be adapted to suit application. The unit is both portable and stationary, with the load rolling on rolls. Height from floor is 14 in. min.

R. T. Sheehan Co., P. O. Box 345, Plymouth, Mich. **T-5-18**

Grinder

Two types of this precision Johansson grinder are available: the 2P for production and the 2U for toolroom and production use. Center distances are 40, 60 and 80 in., and the swing over table is 14 in.

The universal type takes grinding wheels of 20 in. diam and up to 3 in. width; the production model takes up to 30 in. diam and 4-in. width. Table travel is up to 236 ipm. Maximum diameter



in chuck is 7 in. and in collets is 1½ in. The headstock is gearless. Twelve speeds range from 20 to 320 rpm.

The wheel head swivels to allow simultaneous diameter and end-face grinding by profiled wheels. The headstock is rotatable through 360 deg and can be used at either end of the table. Manual and automatic feeds can be operated simultaneously.

Engineering Dept., Homestrand Inc., 9 Addison St., Larchmont, N. Y.

T-5-19

Bench Grinder

Lightweight, compact bench grinder, designated Model DBA-O, is available in both single or three-phase current. The 6 in. diameter, 2 in. wide contact wheel is driven by a 0.6-hp motor developing a belt speed of 5100 fpm. By

SUMP TYPE (cutaway)

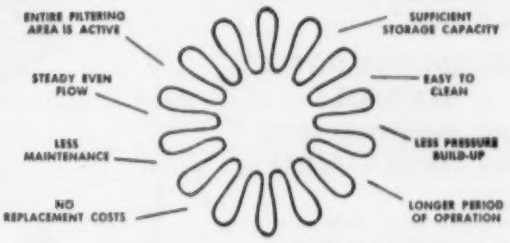
When You Need A Filter—
Get The Advantages of

MARVEL'S

SYNCLINAL DESIGN

It's Balanced For Top Performance!

Look For These Important Features



For All Hydraulic and Other Low Pressure Liquid Systems

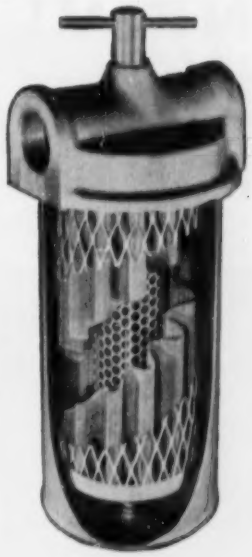
In the selection of a filter to obtain maximum efficiency and quality, the most important point to consider is a specific type filter that will offer greatest ACTIVE filtering area with ample storage capacity for filtered out particles, rather than total filtering area alone. Over 750 Original Equipment Manufacturers install Marvel Synclinal Filters as Standard Equipment because they are designed to give this all-important balance for greatest efficiency in filtration of liquids in all hydraulic and other low pressure circulating systems. Flow of liquids is maintained at a constant, steady rate of speed produced by the pump which brings about the desired effect of a gentle, evenly distributed accumulation of filtered out particles against the entire filtering surface with less restriction of flow. Result—longer periods of productive operation at minimum maintenance down-time. If this important balance is lacking due to efforts to cram too much filtering mesh for the sake of total rather than active area, filters soon become clogged causing pressure build-up, turbulent flow and in general decreases the efficiency of operating equipment. Depend on Marvel Synclinal Filters For All Your Filtration Requirements.

EASY MAINTENANCE

Both sump and line types may be easily disassembled, cleaned and reassembled by any workman, on the spot, in a matter of minutes. Line type operates in any position and may be serviced without disturbing pipe connections.

A SIZE FOR EVERY NEED

Available for sump or line installation in capacities from 5 to 100 G.P.M. Greater capacities may be attained by multiple installation as described in catalog. Choice of Monel mesh sizes range from coarse 30 to fine 200.



LINE TYPE (cutaway)

FILTERS FOR FIRE-RESISTANT HYDRAULIC FLUIDS

Marvels most recent development is a filter for the efficient filtration of all types of fire-resistant hydraulic fluids.

WATER FILTERS

Both sump and line type filters have been adapted for use in all water filtering applications. No changes have been made in the basic, balanced synclinal design.

Catalogs containing complete data available on request.

IMMEDIATE DELIVERY!

As in the past, Marvel continues to offer IMMEDIATE DELIVERY.

MARVEL ENGINEERING COMPANY
7227 N. Hamlin Ave., Chicago 45, Ill.
PHONE: JUniper 8-6023

TE-5

Without obligation, please send me complete data on Marvel Synclinal Filters, as follows:—

- ☐ Catalog #107—For Hydraulic Oils, Coolants and Lubricants
- ☐ Catalog #200—For Fire-resistant hydraulic fluids
- ☐ Catalog #301—For Water

Name .....
Title .....
Company .....
Address .....
City .....
State .....

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-5-173

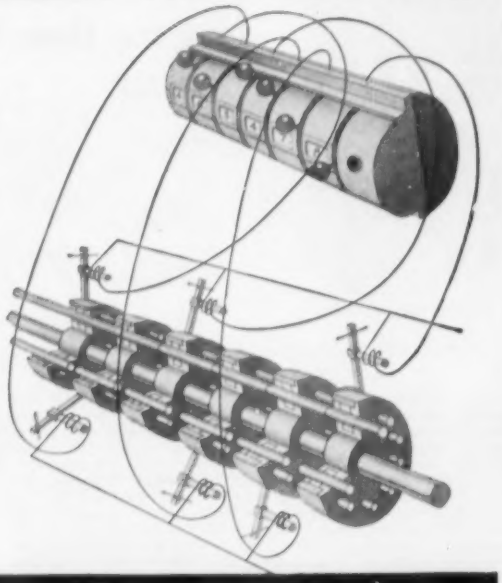
KBF2 BORING AND MILLING MACHINE

WITH AUTOMATIC SPINDLE POSITIONING CONTROLLED BY HAND POSITIONER OR PUNCHED CARD SYSTEM

Preselective automatic positioning anywhere within a 50" x 30" area.

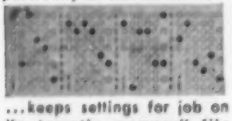
ELIMINATES JIGS & FIXTURES!

FOR SINGLE PIECES, SMALL OR LARGE BATCHES



NEW!

Automatic Punch Card control completely eliminates possibility of human error...



...keeps settings for job on "automatic memory" file whenever job is repeated!

For detailed information and literature, contact sole importers:

MARAC MACHINERY CORP.

45 SO. BROADWAY, YONKERS, N. Y. • YOnkers 8-0500

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-5-174

use of direct drive of the contact wheel there is no loss of power or speed of the abrasive belt. The speed provides quick, cool stock removal. The idler arm incorporates belt tracking and tensioning mechanisms and can be rotated 360 deg around the spindle to provide operation in any position. Standard abrasive belt size is 2 in. wide by 48 in. long.

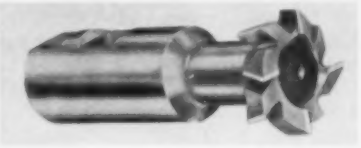
A platen attachment is available for squaring, chamfering, and beveling. It is attached directly to the idler arm and maintains its relationship to the abrasive belt without adjustment regardless of the position of the arm.

Curtis Machine Div., The Carborundum Co., Jamestown, N. Y. **T-5-20**

USE READER SERVICE CARD ON PAGE 169 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

Cutters

Tooth design of this line of standard T-slot cutters, made of high-speed steel, provides ample chip space while flutes are ground to give good chip flow and help prevent clogging. Cutters can be furnished with chip breakers ground on



the teeth. This feature further reduces chip size and aids in chip disposal.

The cutters are carried in stock in sizes ranging from ¼ to 1½ in. bolt size. Carbide tipped T-slot cutters are made to order.

Quality Tool Works, Waukegan, Illinois. **T-5-21**

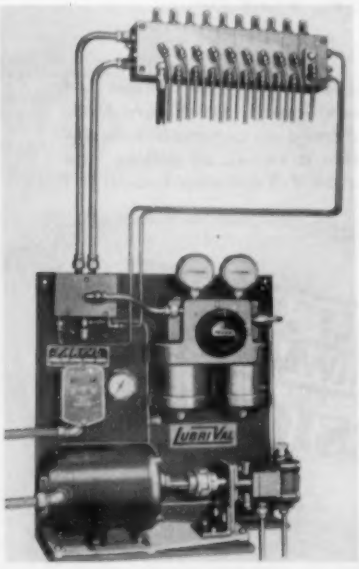
Circulating Oil Lubricating System

Designed to serve the lubrication needs of presses, automatic and semi-automatic machine tools, the Lubrival circulating oil system employs a two-line principle of operation to supply oil under pressure to measuring valves for delivery to bearing points. The valves have individual sight indicators and feed lubricant by positive piston displacement.

A pressure-sensing mechanism allows monitoring of the operation to warn of clogged or broken lines in any part of the system.

The pumping unit is designed to permit selection of the number of injec-

tions per minute to be applied to bearing points. There is no limit to the number of measuring valves that can be manifolded together to serve a piece of equipment, and the valves are manufactured in two capacities for interchangeable installation as required. Because each valve is designed to serve two bearings, a simple,



external cross-porting accessory can be attached at any time to merge two discharge ports into one. Temperature-induced changes in oil viscosity have no effect on value deliveries.

The Farval Corp., 3249 80th St., Cleveland, Ohio. **T-5-22**

Power Saw

Model C-12 power saw has a capacity to handle 12-in. rounds, 12 x 12-in. square stock and work weighing up to 1500 lb. It is designed for rapid setup and rapid cutting. Step pulleys provide 4 speeds; thus one speed may be selected for the principal work performed by a particular shop, yet a wide range is available for other cutting jobs. Built-in coolant system and hydraulic band tension control assure long blade life and rapid cutting.

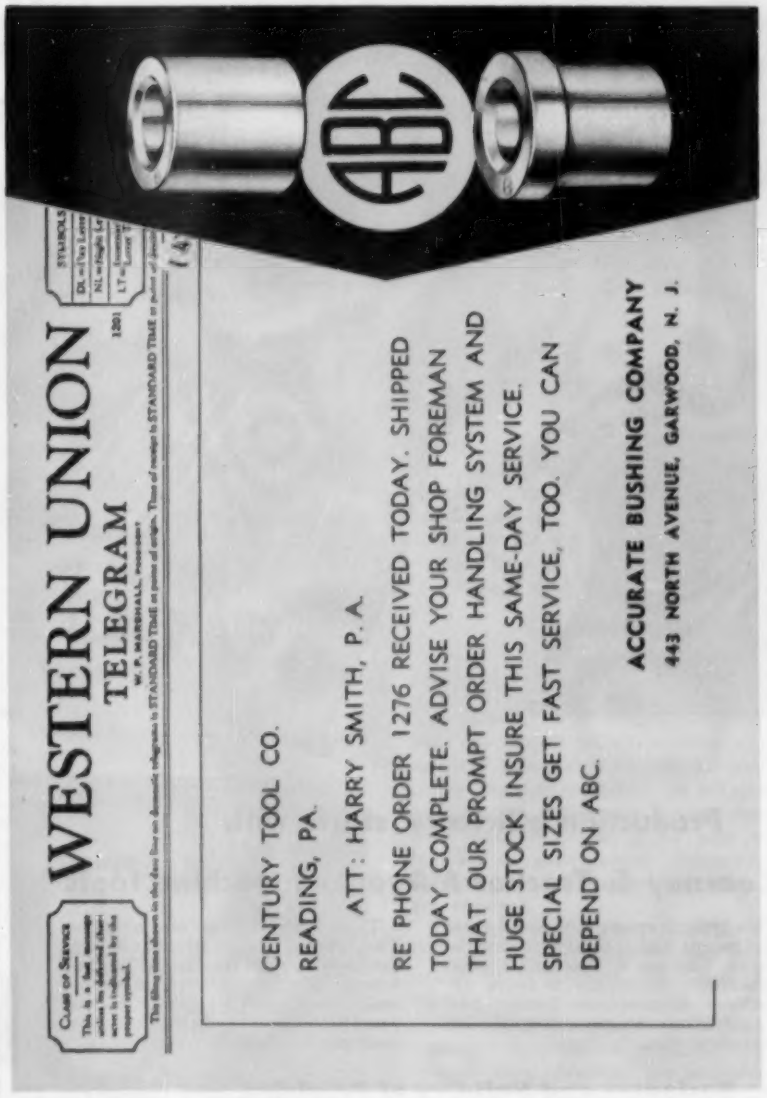
Particular effort has been made to simplify operational procedure. Start-stop pushbuttons for the electric motor and control for the hydraulic feed are conveniently grouped together on a panel near the front of the machine. An automatic hydraulic lock prevents movement of the cutting head when the electric power is cut off.

All moving parts except the portion of the saw blade actually cutting, are enclosed. Chips fall into a drawer in the base of the machine.

The DoAll Co., Des Plaines, Ill. **T-5-23**

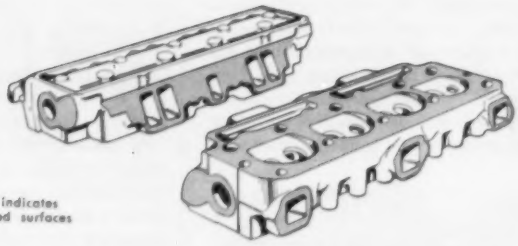
Carbide Tool Grinder

Thorough-wheel coolant and cutting oil feed with sight-measured drip control are provided in this single-point carbide tool and carbide drill grinder called the Coolie-Grinderlap. The tool has a 6-in.-60 grit roughing green wheel and a 6-in. Re-Lod-Able diamond finishing wheel, 325 screen, mounted on opposite ends of the motor shaft. Efficient wheel coolant distribution through the Coolie ring reduces temperature of the tilted worktable and at the work face of the rough grinding wheel. Water is introduced at the back of the wheel by gravity feed—thence through eight ⅛-in. holes from the groove through the metal back of the cup grinding wheel and thence by centrifugal force out to the work surface


WESTERN UNION
TELEGRAM
W. P. MARSHALL, PRESIDENT
CENTURY TOOL CO.
READING, PA.
ATT: HARRY SMITH, P. A.
RE PHONE ORDER 1276 RECEIVED TODAY. SHIPPED
TODAY COMPLETE. ADVISE YOUR SHOP FOREMAN
THAT OUR PROMPT ORDER HANDLING SYSTEM AND
HUGE STOCK INSURE THIS SAME-DAY SERVICE.
SPECIAL SIZES GET FAST SERVICE, TOO. YOU CAN
DEPEND ON ABC.
ACCURATE BUSHING COMPANY
443 NORTH AVENUE, GARWOOD, N. J.

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-5-175

CUSTOMER SPECIFIED



Tone indicates machined surfaces

A leading automobile company requested Kearney & Trecker's Special Machinery Division to design and build an automatic transfer machine to perform a series of milling and drilling operations on V-8 cylinder heads.

KEARNEY & TRECKER MILWAUKEE® DESIGNED

Kearney & Trecker built this 12-Station Automatic Transfer machine which rough and finish mills the head gasket surfaces, mills intake and exhaust port surfaces and both ends, and drills, counterdrills and reams two holes on each of two cylinder heads for V-8 engines. Machine's production rate is 100 pieces per hour.

The two cylinder heads progress automatically through the machine side by side, each on separate transfer rails. Transferring, locating, clamping, lubrication and chip disposal are all automatic.

For more information on machine illustrated, ask for Data Sheet No. 1080. A new bulletin, SMD-56, which describes many of our outstanding designs, is also yours for the asking.

Production efficiency starts with

Kearney & Trecker Milwaukee machine tools

This typical example reduced costs and meant higher production for the buyer. Kearney & Trecker's Special Machinery Division's 50 years' experience in machine design and manufacture can mean considerable savings to you.

Take advantage of our abilities. They can pay off in profits for you. See or write your Kearney & Trecker Special Machinery Division representative. He will be pleased to give you all the details on this production machine. Contact him today!

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of the wheel. There is no exposed drip pipe over the front of the grinding wheel. A 6-oz Gito sight-feed oiler is used for the supply of liquid. One filling lasts for 2 hours or more of continued use by the regulated control. To secure a quick instant flood on the tool the operator raises the control regulator, which returns to the regulated drip immediately when released. The drip is easily shut off when not in use. No seals or pumps are employed.

Two models are in production: Model 01 is a ⅓-hp single phase capacitor type reversible motor, and Model OX is the same machine with a ½-hp motor —the motors turn 3450 rpm.

Each machine comes in a floor model 42 in. high to shaft, and each is convertible to a bench model.

Diamond Tool Co., Dept. T, Box 32, South Haven, Mich. **T-5-24**

USE READER SERVICE CARD ON PAGE 169 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

Motor-Generator Welders

Line of motor-generator welders are compactly designed so that they may be stacked one atop the other.

The welders, designated WD30AE and WD40AE, have magnetic starters with fast response, bimetallic thermal overload relays which prevent motor burnout in the event of motor overload. The relays will kick out in less than 10 sec in stalled single phase, and in less than 8 sec if the rotor is locked in normal three-phase position.

Oversize bearings are rubber-mounted for quiet operation. An air bypass in the intermediate bearing housing and a dust cap on the commutator and bearing prevent dust contamination.

High recovery voltages and controlled current peaks with pop-out-free arcs are the same as produced by engine-driven units.

Built with pushbutton controls, the units include generator, driving motor and accompanying controls, all encased in a weather resistant, self-ventilated case.

Driving motors and motor starters on dual-voltage machines are designed to accommodate voltage reconnection without changing overload relay heaters and other accessories.

The generator employs the Bergman split-pole principle, and is self-excited from an independent third brush. This design, combined with the GE transformer reactor, produces a penetrating arc.

Welding Dept., General Electric Co., Schenectady 5, N. Y. **T-5-25**

Drill for Hard Metals

In this drill, known as Du-Drill, the tungsten carbide tip is welded to the steel shank. Regardless of the heat generated by drilling, the weld does not fail.

The Du-Drill will drill materials with hardnesses ranging from 35 to 84 R_C easily. The tool cuts and does not anneal, burn or melt. It will drill accurately within 0.0005 in. and leave a highly polished surface. It may be used to drill high-speed steel, ceramics, and glass.

Coffey-Cummins Mfg. Co., Pasadena, Calif. **T-5-26**

Indicator Depth Gages

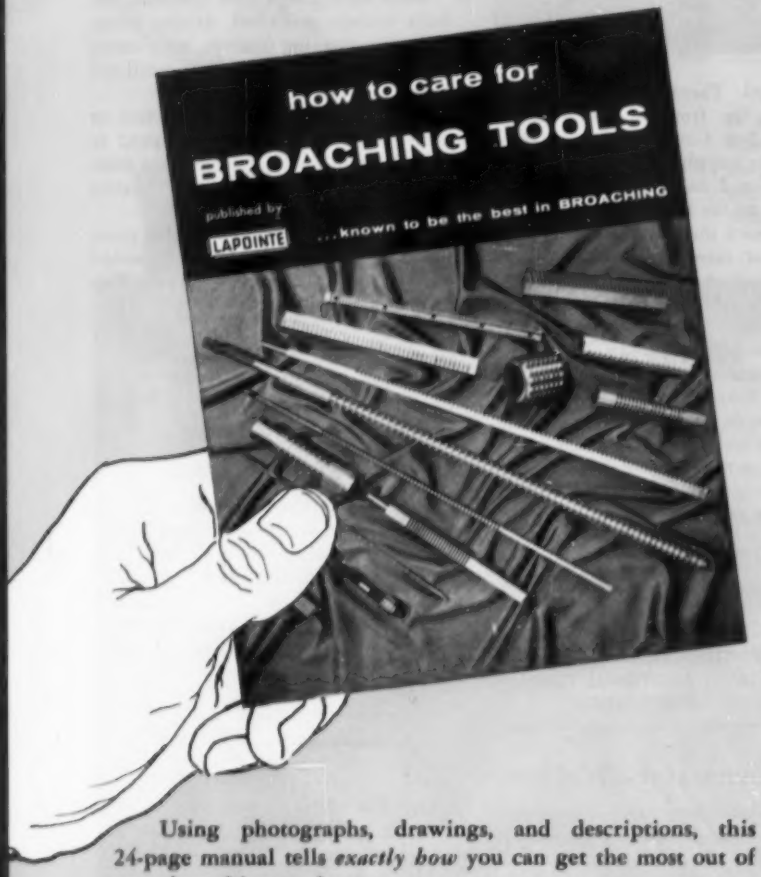
A standard series of interchangeable gage components permits selection of a standard indicator depth gage for practically any part condition. By selective variation of components, more than 3500 standard depth gages may be specified to gage special dimensions. No alterations of standard components are required.

Complete depth gages may be ordered by combining the selected component model numbers, eliminating the necessity of design drawings in most cases. Where permanent record drawings are desirable or required, full-scale tracing templates are available. All standard models may be easily set

This valuable manual

published by LAPOINTE

is yours for the asking



Using photographs, drawings, and descriptions, this 24-page manual tells *exactly how* you can get the most out of your broaching tools

- **while on the machine**
- **when re-sharpening**
- **in transferring between departments in the shop.**

Divided into three sections as noted above, there are nearly fifty specific recommendations in the booklet, plus a special section of seven tips of caution . . . "Never!" . . . using cartoons to drive home the points.

A copy will be sent to you immediately on receipt of your request.

Ask for BOOKLET "B"

LAPOINTE-BROACHES, *Electrolized* increase broach life between grinds from 2 to 10 times.

THE LAPOINTE MACHINE TOOL CO.
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THE WORLD'S OLDEST AND LARGEST MANUFACTURERS OF BROACHING MACHINES AND BROACHES

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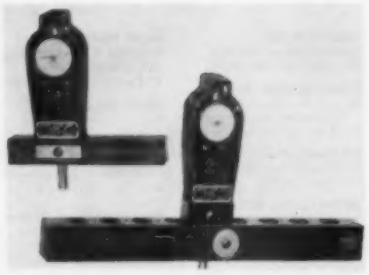


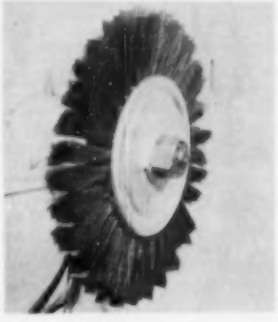
to either gage blocks or a master set gage. Any popular make of indicator may be furnished with the gage.

A. G. Davis Gage & Engineering Co., 21435 Dequindre, Hazel Park, Mich. **T-5-27**

Polishing Head

To broaden their fields of application, Vonnegut brush back polishing heads are now built in 1-in. widths and furnished with long-trim bristle brushes as standard equipment, when specified.

The narrow type Vonnegut head also generates a self-cooling action. The tool is particularly useful for contour



surfaces or on intricate designs in metal, wood, rubber, plastics or other materials. The head also fits shorter spindles and allows more maneuverability than previous model.

Grinding and Polishing Machinery Corp., 2530 Winthrop Ave., Indianapolis, Ind. **T-5-28**

Storage Feed Unit

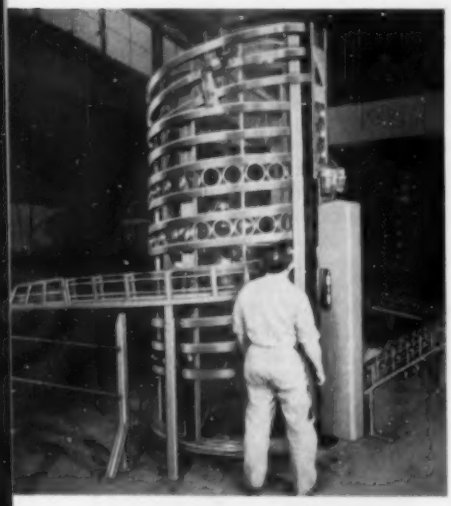
Parts or blanks can roll from this rotary high-capacity storage unit for use in automated processing lines, thus providing a demand-feeding system from a controlled mobile storage medium. In the illustration, the principle is used to store and feed ring-gear blanks for a broaching operation. Capacity with this part is over 300 units. Operation is all-pneumatic.

Each unit is tailored to a specific job and assembled from standard com-

ponents. Rotary form is provided in either circular or oval shape to meet floor space requirements.

Parts are guided through a silhouette accept-reject device to fully caged double tracks and gravity fed to a push type double shaft elevator working off a stroke-lift pneumatic piston. Lifting speed of the elevator is adjustable. Either elevator shaft can be operated independently.

Parts can be positioned vertically or horizontally for the following machine



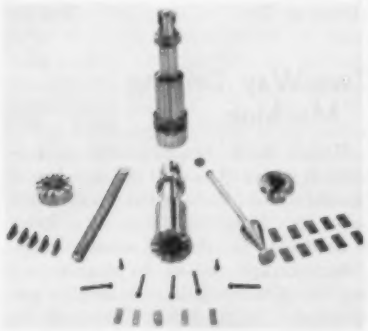
operation. Air cylinder-operated gates in the tracks control movement of the parts on demand. Even at high speed, delivery of unmarred parts is assured.

When used for stockpiling of parts, the equipment automatically stops when full capacity has been reached.

Gear-O-Mation Div., Michigan Tool Co., 7173 E. McNichols Rd., Detroit 12. Mich. **T-5-29**

Honing Tool

Replaceable carbide inserts are used to form the two long sides or bearing surfaces of the slots through which stones are expanded on this quick-loading, high-production honing tool. The

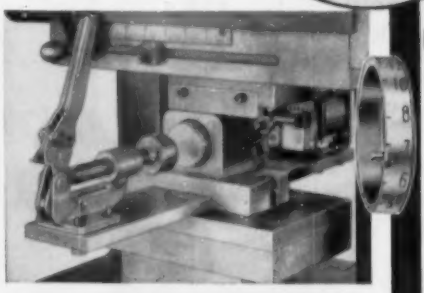


MARK *Your* PRODUCT FOR *More Sales!*

for identity, for product recognition

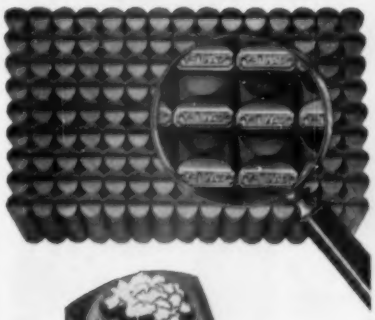
BY HAND...

handstamp trade marks, legends on short run components.



BY MACHINE...

automation in marking on production runs, manually, hydraulically or by air.



BY PRESS...

for metal, wood or plastic products with standard or special marking dies.

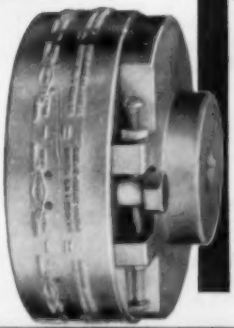
BY HOT STAMPING...

for indenting softer materials or stamping gold leaf or foil into plastic, leather, etc.

BY PRINTING...

on virtually any surface with flat, concave, convex or roll printing dies.

Send for folders and descriptive literature on Parker marking tools and machinery.



Give your product the mark of quality with ... MARKING TOOLS & MACHINERY by Parker!

THE PARKER-HARTFORD CORPORATION

MARKING DIE & MACHINERY DIV.

FRANKLIN AVENUE • HARTFORD, CONNECTICUT

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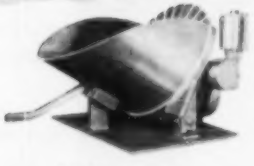
Are You *SHARING*

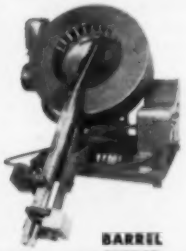
the production advantages of DPS POWER METHODS?

Widespread applications by the thousands prove this modern ASSEMBLY EQUIPMENT to be highly profitable and fully adaptable to your special requirements!

BOWL FEEDER
Electrical vibratory type to feed parts that cannot be tumbled.



BARREL FEEDER
with stationary ring cover for heavy-duty production.



BARREL FEEDER
Popular motorized type, for parts requiring critical selection.

Write for Literature Today!

DETROIT POWER SCREWDRIVER CO.

2799-A W. FORT STREET DETROIT 26, MICHIGAN

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-5-180

inserts function as guides and serve to reduce wear and allow shop maintenance of the tool body, thus increasing tool life.

The photograph shows construction of the tool. Also shown is the wing type honing stone used by these tools.

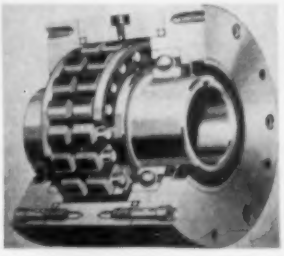
Range of the plate type tool is from 1½ in. min to 5 in. max ID. Stone lengths are from 3-in. min to 5-in. max.

Barnes Drill Co., 870 Chestnut St., Rockford, Ill. **T-5-30**

Overruning Clutches

Two series of sealed, double ball-bearing sprag clutches for overrunning, indexing and backstopping purposes are designed primarily for indexing applications in which the retention of light oil is essential to long life and accurate indexing. The seals prevent foreign particles from entering the clutch, as in an atmosphere where abrasives are present.

Series B is used for true overrunning applications, for low-speed service where the inner race overruns (where both races rotate during some portion



of the cycle). It is available in bore diameters from 2¼ to 5½ in., with torque capacities from 1875 to 11,600 ft-lb.

Series C, for indexing and backstopping applications, is available in bore diameters from 2¾ to 5½ in., with torque capacities from 3160 to 11,600 ft-lb.

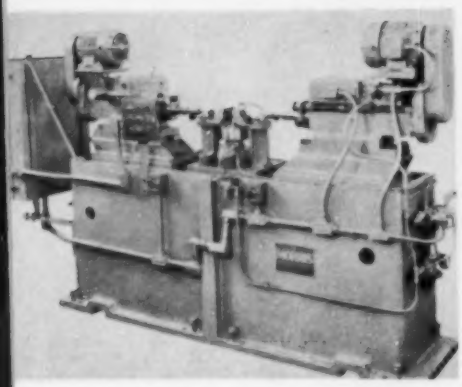
Overrunning and indexing clutches of both Series B and Series C are oil-lubricated; backstopping clutches of Series C are grease-lubricated.

Application Engineering Dept., Formsprag Co., 23601 Hoover Rd., Van Dyke, Mich. **T-5-31**

Two-Way Drilling Machine

Model 350-S two-way drilling machine is designed to drill either 2, 5 or 6 equally spaced holes arranged in a circular part. Selection of number of holes to be drilled is achieved automatically.

Basic components of the machine are two Air-oil-matic drill units and an air-operated indexing fixture. They are in-



terlocked in a variety of automatic cycle combinations to obtain the holes required.

The air-powered, hydraulically controlled units offer adjustable feed rate, feed stroke and total stroke, with a wide range of spindle speeds. Drill sizes range to $\frac{5}{8}$-in. diameter.

The Morris Machine Tool Co., 933-37 Harriet St., Cincinnati 3, Ohio.

T-5-32

USE READER SERVICE CARD ON PAGE 169 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

Oxide Chip Breaker

High resistance to abrasion and cratering is offered by oxide chip breakers. Because of the exceedingly low coefficient of friction and low thermal conductivity of the material, friction heat is negligible and the chip breaker does not absorb heat from the chip or transfer it to the metal toolholder. This prevents expansion and contraction of the assembly, and allows rigid clamping to be maintained.

This chip breaker can be used with any type of toolholder which will accommodate its design.

Diamonite Products Mfg. Co., Canton, Ohio. **T-5-33**

Abrasive Belt Machines

Three coated abrasive belt machines designed for grinding and polishing large diameter tanks include a seam weld grinder and polisher, an ID tank grinder and polisher, and a tank head grinder and polisher.

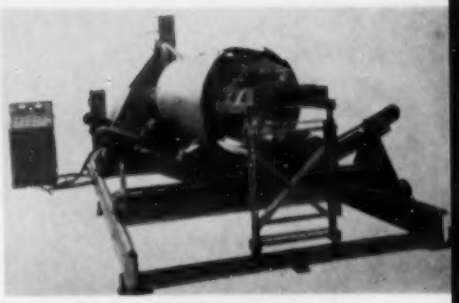
The seam weld grinder and polisher is designed to handle seam welds on flat sheets or open-end tanks with a minimum of 30 in. in diameter, up to 10 ft long.

Controls for the grinder, which has a traversing head, are centered in a console. Operator can even control spot grinding from the console. Adjustable stops on the traversing mechanism regulate the length of travel.

Coated abrasive belt speed is 6500 fpm, and the grinding head has a traverse speed of 20 fpm. Automatic cutting oil applicator operates only when the belt is in contact with the work. Belt widths run from $\frac{1}{2}$ to $2\frac{1}{2}$ in., and close accuracy is possible so as not to undercut the weld or disturb the finish on either side of it.

A gantry type seam weld grinder also is available for grinding welds where multiple steel sheets have been joined.

ID tank grinder and polisher, for polishing the inside diameters of open and cylindrical tanks, produces a uniform longitudinal scratch pattern. The machine is designed for tanks ranging from 33 in. to 20 ft in diameter, and up to 12 ft long, and utilizes a 6 x 148-in. coated abrasive belt.



ID tank grinder and polisher. Control console is shown at the left.

The machine is approximately 8 ft wide by 22 ft long, and has a belt speed of 6500 fpm with a traverse speed of up to 20 fpm. An automatic oil spray device lubricates the belt.

Tank head grinder and polisher,

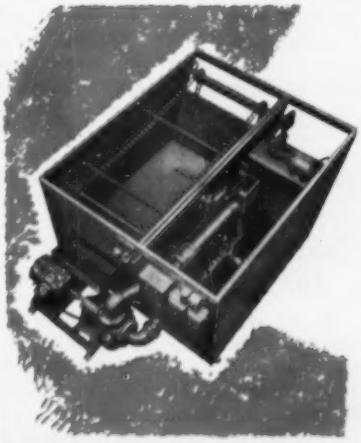
BIG in Capacity

HIGH in Filter Efficiency

SMALL in Micro-Inch Particle Size

Delpark **Filter-Matic**

TUBULAR SCREEN VACUUM FILTER



The response to DELPARK'S FILTER-MATIC vacuum filter has been tremendous. The reasons for such interest is obvious. The DELPARK FILTER-MATIC occupies a minimum of floor space, yet it handles an extremely high rate of flow. With these features, DELPARK engineering has achieved such a high degree of filtration that low micro-inch production finishes are easy to attain.

Permanent filter media used in the DELPARK FILTER-MATIC may be used without filter-aid. Where absolute filtration is required, precoat may be used as needed. Capacities 5-1000 g.p.m.

Write giving complete details for more information on DELPARK FILTER-MATICS *as applied to your filtration problems.*

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INDUSTRIAL FILTRATION COMPANY

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LEBANON, INDIANA

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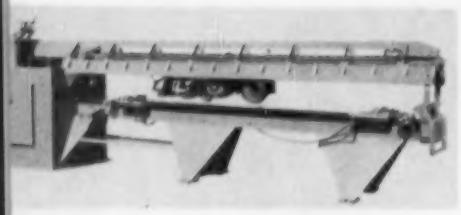


Seam weld grinder and polisher.

which operates on the principle of a swing grinder, is designed so that the operator has full view of the point of contact. The machine utilizes a 1, 1½ or 2-in. coated abrasive belt running over a serrated rubber contact wheel, with a belt speed of 6500 fpm.

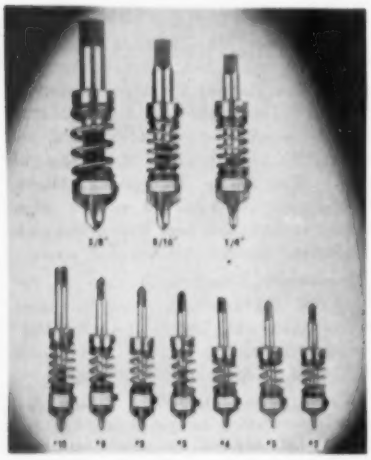
The head grinder can be used on either the inside or outside of pressed or spun stainless steel tank heads, which are held by either mechanical or vacuum clamping methods. The standard model head grinder will accommodate tank heads up to 6 ft in diameter.

Machine information is available from Hi-Lite Polishing Machine Co., Dept. F7-49, Route 2, Sheboygan, Wis. Coated abrasive belt information, from Minnesota Mining & Mfg. Co., Dept. F 7-49, 900 Fauquier St., St. Paul 6, Minn.

T-5-34

Chamfering Tool

The Burr-Bit, a chamfering tool for deburring tapped holes, slips over the tap and deburrs the tapped hole as the tap is being withdrawn, thus eliminating a separate deburring operation. Ad-



justed to the varying web thicknesses of the tap by a Nylock set screw inside the flute of the tap, the Burr-Bit can be used on almost any tap.

Present design allows blades of the tool to be sharpened without the necessity of having a special grinding fixture. The device may be used efficiently on thin material since it chamfers just the top thread, allowing more threads per inch for gripping.

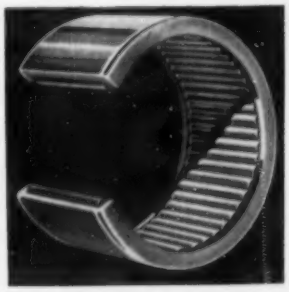
The Burr-Bit fits all two and four fluted taps from No. 2 to ½ in. in all pitches.

Vernon Devices, Inc., 481 E. 3rd St., Mt. Vernon, N. Y. **T-5-35**

Needle Roller Bearings

Thin-shell needle roller bearing uses spherical-end rollers, which give maximum capacity due to the longer area of contact. Rounded ends of the rollers present a smooth surface contact with the shell.

The shells are made of SAE 1010 steel carbo-nitrited to 60 R_C minimum. Rollers are made of SAE 50100 steel, also hardened to Rockwell 60 R_C. These



bearings are used with shafts of the same hardness to obtain maximum capacity and life.

Two sizes are presently available. KN-172108 has shaft diameter of 1.0605 in. with tolerance from +0.000 to −0.0005 in. KN-192410 has a shaft diameter of 1.1875 in. with the same tolerance. Housing bores are 1.3130 and 1.5005 in. respectively. Bearing widths are 0.500 and 0.625 in. respectively. Number, length and diameter of rollers are 39 x 0.416 x 0.0925 and 34 x 0.535 x 0.1205.

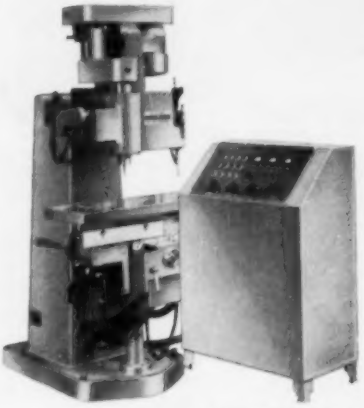
Kaydon Engineering Corp., Muskegon, Mich. **T-5-36**

Gear Hobber For Tandem Setups

Model 1433 Ultra-Speed hobber for small gears is easily adaptable to any degree of automation. Using a common sub-base, the machines can be set up in tandem or unlimited series with automatic through-feeding and removal of parts. Gear washers and gear classifiers can be easily integrated into the machine units. Automatic size control is also provided.

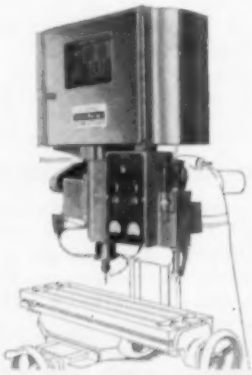
All machine services are self-contained in the sub-base, including air or hydraulic pressure lines for operation of feeds, self-contained coolant system

REPRODUCE WITHOUT TOUCHING THE MODEL — WITH PRATT & WHITNEY VELVETRACE EQUIPMENT

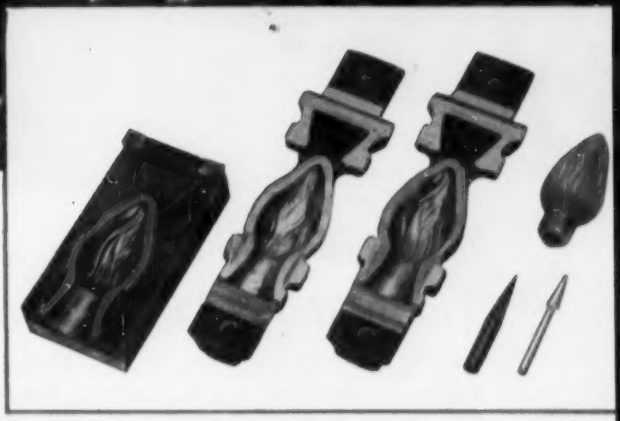


VELVETRACE® MILLING MACHINE . . .
Ultimate in accuracy for 3-dimensional tracer-controlled reproduction. Spindle speeds from 310 to 10,800 rpm. Work size capacity 9" x 12".

THE VELVETRACE DUPLEX ROTARY FIXTURE . . .
is easily mounted on the table of the Velvetrace Milling Machine. Offers faster setup and machining, and more desirable feed patterns, for milling a variety of linear or circular work.



VELVETRACE MILLING ATTACHMENT . . .
a complete, easily attached unit that brings the outstanding advantages of Velvetrace 3-dimensional tracer control to most conventional milling machines.

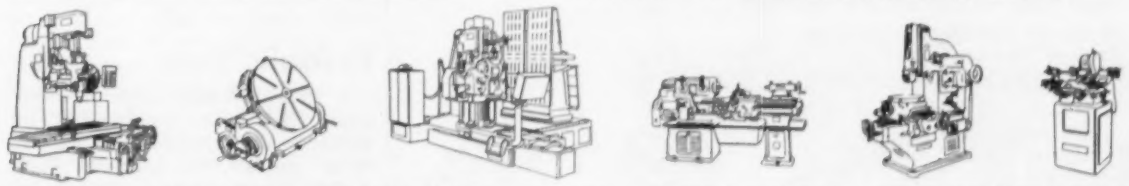


Putting PRECISION REPRODUCTION *in a New Light*

BECAUSE THE PRATT & WHITNEY "VELVETRACE"® MACHINE DUPLICATES THE FINEST DETAIL WITHOUT TOUCHING THE MODEL . . .

These flame-shaped light bulb molds, produced for Corning Glass Works, were machined with such fine detail on the Velvetrace that no hand finishing was required.
Ideal for your die, mold, prototype and other work, the Velvetrace employs a unique *non-contacting* tracer control that follows any 3-dimensional model without touching it . . . cannot damage your model, however soft or fragile, even when using the smallest diameter tracer points. Fully automatic operation with variable speed control to compensate for changes in contour, and a wide range of spindle speeds from 310 to 10,800 rpm insures you fast, economical production.

Write for complete information.
Pratt & Whitney Company, Incorporated,
16 Charter Oak Boulevard, West Hartford. Conn.



JIG BORERS . . . ROTARY TABLES . . . KELLER MACHINES . . . LATHES . . . VERTICAL SHAPERS . . . CUTTER AND RADIUS GRINDERS

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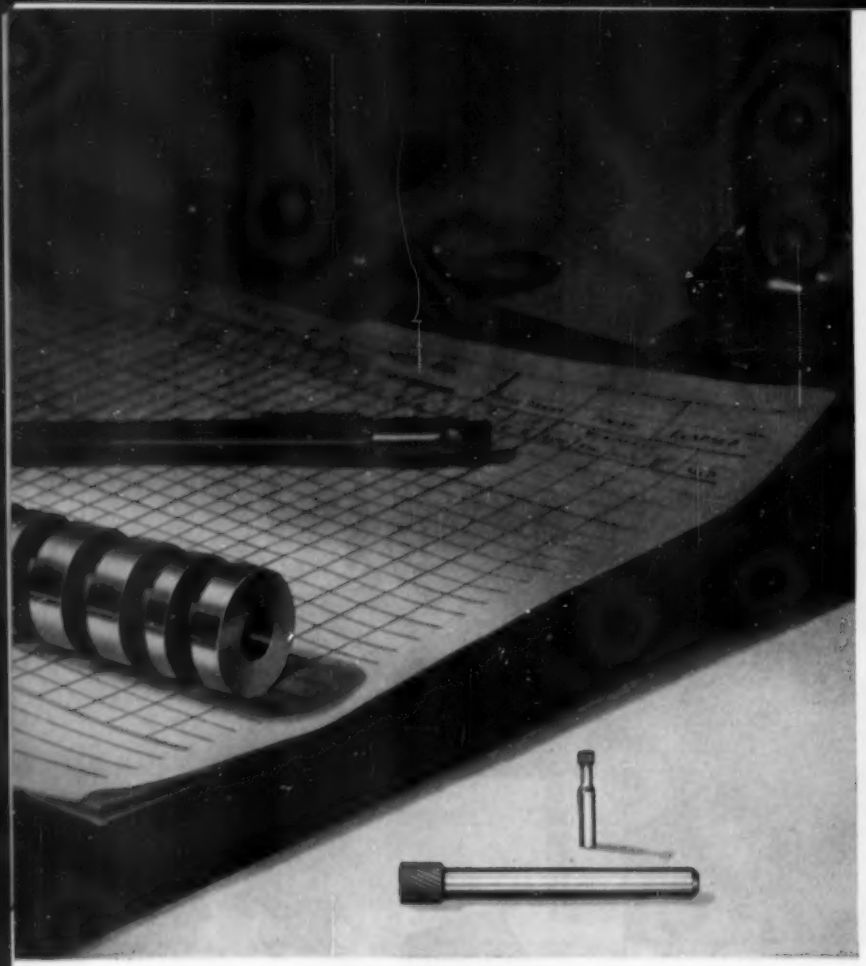
MACHINE TOOLS • GAGES • CUTTING TOOLS



Figures Prove
They Last 3 Times Longer!

When it comes to finishing small holes – down to .032" diameter – P&W Kellerflex Carbide Hole Finishing Burs have proved on job after job that they will consistently *outlast and outperform* all other finishing methods and competitive burs. On one recent job, P&W Burs lasted more than 3 times longer than the next best. On another, they delivered up to 5000 pieces per bur. In addition, P&W Burs speed up production . . . machining time is as little as 30 seconds per piece. Accuracy and finish are improved . . . work has consistently been held to .0002" for size, .00005" for roundness, and 4 micro-inches for finish! The fast-growing miniaturization market can mean BIG profits from small parts, and P&W Carbide Burs finishing small holes can help you get your share.

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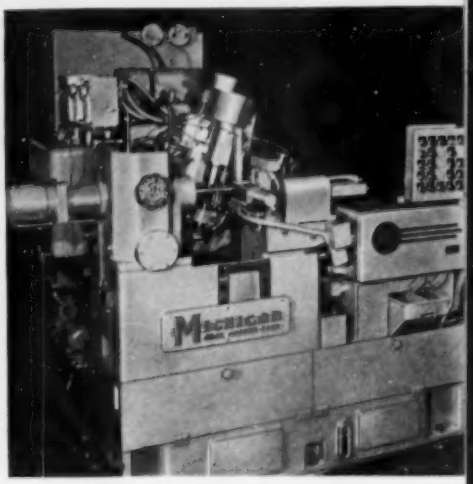
or coolant piping for addition to central system, conveyor for removing chips, used-coolant return line, conveyor lines to remove finished parts, and central system lubrication lines. Master panel and electrical connections are mounted in the sub-base, so that the hobbing unit can be readily removed from sub-base without affecting in-line gear production.

The 1433 horizontal, single-spindle hobber will hob up to 12-pitch spur gears or helical gears. Maximum center distance, hob arbor to work spindle, is 3¼ in. Maximum crossfeed stroke



of hob is 4 in. Either right or left-hand helix angles up to 30 deg can be hobbed.

Work rotation is by a preset timed relationship with the hob, controlled by conveniently located change gears. The entire hobbing cycle is automatic, with loading time measured in seconds. Hobs revolve at selected speeds up to 500 rpm. Either conventional or climb hobbing may be used with single, double or triple thread hobs. Three separate adjustments may be made to the hob head; hob thread angle, gear helix angle, and automatic hob position shift.

All controls are safety interlocked and all circuits are to JIC standards.

Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich. **T-5-37**

Hydraulic Shear

A ½-in. hydraulic shear cuts full-length ¾-in. plate continuously. By increasing the adjustable rake angle to ¾ in. per foot, the shear cuts ¾-in. steel plate with the force normally required to cut ½-in. plate. In cutting ½-in. plate, which is its rated capacity, the shear cuts exactly the same as conventional fixed rake angle shears. In cutting ¼-in. steel, the rake angle is

reduced to 3/32 in. per foot and the shear will cut strips 24 in. long up to 60 per minute with minimum twist and bow.

From 20-ga to 3/4-in. plate may be cut with single knife clearance. For precision cutting, knife clearance can be adjusted in 30 sec to match plate thickness. Shear cuts noiselessly without shock. The ram, controlled by a portable foot pedal, can be stopped immediately at any point throughout the stroke.

Pacific Industrial Mfg. Co., 848 Forty-Ninth Ave., Oakland 1, Calif.

T-5-38

USE READER SERVICE CARD ON PAGE 169 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

Compacting Press

Designed to provide easy application of accessories, this lever type compacting press has packaged D-frame construction to promote steady, precise operation. Designed primarily for powder metals, the press also operates efficiently with powder ceramics, carbides, cermets and ferrites.

Pressure-rated at 30 tons, this 30-W press can be equipped in the field with accessories which are packaged and fit into place without machining of any kind. Such accessories include an independent floating core rod support for the forming of blind or counter-bored holes, a cushion cylinder to operate a secondary top punch, prepressing die control, dual ejection mechanism and precision indicators for adjustments.

Drive is adjustable speed, and range of the machine is from 10 to 40 strokes per minute. Guides provide precise alignment of the upper punch, die, lower punch and core rod. Floating die holder and the core rod support are an integral unit and can float through an adjustable range up to 2¾ in.

Head stroke is 6¾ in., the same as

He's doing the job
FASTER and CLEANER

...BECAUSE P&W KELLERFLEX® BURS are MASTER MACHINE GROUND

Precision in every respect, they cut faster and smoother without chatter or bounce and deliver an overall performance efficiency that *no* hand ground bur can possibly match. All P&W Burs of the same size and shape are exact *duplicates* . . . have *identical* cutting characteristics. And you can select the *right* bur for all your jobs from the complete P&W Kellerflex line that includes: high speed steel or solid carbide types, 3 basic cuts, 4 shank sizes, 6 types of master ground fluting and 18 standard shapes (plus hundreds of specials). Available from stock at the P&W Branch Office near you.

Write now for complete information.
Pratt & Whitney Company, Inc.
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the maximum daylight opening. Ejection capacity of the machine is 20 tons and the ejection stroke is adjustable up to 4½ in. Depth of the fill is adjustable up to 4½ in.; die opening is 10 in. A shuttle type feeder is used.

Powering the 30-W is a 5 hp motor, totally enclosed and fan-cooled. There are pushbuttons for start and jog. The press is equipped with an automatic lubrication system.

Hydraulic and Compacting Press Dept., Box No. 160, Hamilton Div., Baldwin-Lima-Hamilton Corp., Hamilton, O. **T-5-39**

Gun Drill Type Reamer

Precision holes in cast iron, bronze, aluminum and steel parts can be reamed by this gun drill type tool called the Starbore reamer, which combines the production advantages of a gun drill with those of a carbide reamer.

The two-flute reamer has a molded solid carbide tip brazed to a tubular steel shank. Coolant under pressure is directed through the shank into both flutes to provide adequate cooling of the cutting surfaces as well as a chip flushing action.

Particularly suitable for enlarging previously drilled or cored holes to finish size, the tools are used in conjunction with a bushing which guides the tool in the initial reaming stages.

Either straight or taper shanks can

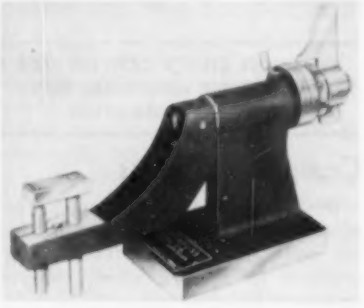
be supplied. Coolant pressures required for Starbore reamers are in the 75 to 400-psi range.

Star Cutter Co., 34500 Grand River Ave., Farmington, Mich. **T-5-40**

USE READER SERVICE CARD ON PAGE 169 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

Radius Dresser

The G-5 radius dressing tool is engineered so as to enable an unskilled workman to dress either a convex or a concave radius from 0.015 to 1.750 in. on any grinding wheel up to 10 in. in diameter. The tool has graduated stops



that allow the operator to dress any portion of a wheel's radius. A spring-tension journal assures chatter-free operation.

Rothfuss Tool Co., Box 2804, Providence 7, R. I. **T-5-41**

Heavy-Duty Plug Valves

Compact, stainless steel plug valves, trade-named Tufline, have Teflon sleeves which require no lubrication. The internal ribbed construction which locks the sleeve in position for high-pressure continuous sealing around body ports and bore, permits sleeve expansion and contraction without leakage.

Low-friction sleeve permits free turning of the plug under all operating conditions, and plug rotation is limited to one-quarter turn by stops in the valve

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Rack Sizes from 48 D.P. to 3 D.P. in 6 ft. lengths 14½ or 20 pressure angle
WRITE FOR PRICE LIST R-1
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FACE WIDTH
PITCH LINE TO BACK
OVERALL THICKNESS
Racks are available in the following stock lengths:
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3/16" to 3/8" sq. inclusive ... 2+ and 4+ feet
1/2" square and heavier ... 4* and 6* feet
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+Approximately 24-5/8" and 48-5/8" long to allow for cutting or matching.
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cover. Fully enclosed metal construction, shield type epoxy-coated wrench, absence of exposed Teflon, and four-bolted cover give maximum protection against fire or line shock.

The valves are useful for liquid and gaseous corrosives; solvent and slurry services; or for hydraulic and pneumatic services where standard valves will not seat because of mechanical interference from entrained solids, polymerization, crystalline deposits, or heavy slurries. Tufline valves are in the 150-lb class, will operate continually at temperatures from −150 F to +400 F, and under pressures from 230 psi down to high vacuum. Valves meet MSS-SP42 specifications; flange and wall thicknesses meet ASA standards.

Furnished in a range of sizes from ¼ through 2 in., screwed end (Series 66), and ½ through 2 in., flanged end (Series 67) in 18-8-SMO stainless (type 316), Alloy 20, 18-8-S (type 304) and other alloys.

Continental Mfg. Co., 247 Park Ave., New York 17, N. Y. **T-5-42**

End Mills

Ski-Kut end mills, specially designed for cutting aluminum, have a narrow primary flute face which minimizes adherence of chips to the flute face. Helix angle of these end mills is 45 deg which provides an unusually smooth shearing action. Hammering action is practically eliminated.

Design of the Ski-Kut end mills permits greater feeds than with conventional tools, long tool life, good finish, easy operation, and requires low horsepower.

The end mills are available from stock in sizes from ¼ to 2 in. in various lengths.

Weldon Tool Co., 3000 Woodhill, Cleveland, Ohio. **T-5-43**

Reinforced Grinding Wheel

Flared cup wheel construction of this reinforced grinding wheel, known as Safety Back, is designed to offer original strength and breakage resistance, to provide maximum accident prevention. Steel covers the entire back, and extends down the side to add more reinforcement.

The Safety Back materially aids in overcoming abusive wheel mounting and operating practices. Steel-backed threaded steel insert provides convenient and secure mounting, while avoiding possibility of the hub being pulled out.

The disposable Safety Back covers no more of the wheel than a revolving cup guard, and cannot interfere with the operator's maneuvering; it does not require constant adjustment.

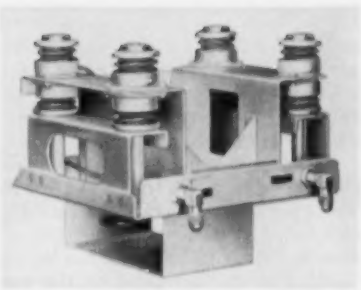
Abrasive Wheel Dept., Manhattan Rubber Div., Passaic, N. J. **T-5-44**

Shock Mounts

Air-borne mounting system, Model 1365, for vibration and shock protection of electronic and pressurized equipment is constructed in accordance with applicable military specifications.

Made up of Met-L-Flex stainless steel wire, the mounts are compressed and formed to specific engineering requirements and have a high percentage of inherent damping. Through this protection resonant peaks are reduced and severe transient forces are quickly dissipated.

Effective attenuation of disturbing forces in all planes is assured with this center-of-gravity mounting system.



Model 1365 has a natural frequency between 15-17 cps. Resulting amount of vibration isolation is 70 percent at 40 cps. Performance is unaffected by oils, solvents, water, fungus or extreme temperatures.

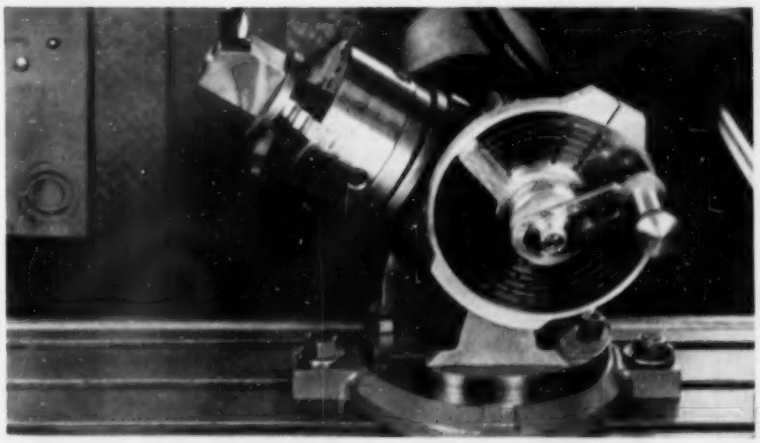
Robinson Aviation, Inc., Teterboro, N. J. **T-5-45**

Heavy-Duty Lathe

Rough or precision cuts are handled with equal effectiveness by this heavy-duty No. 4025 lathe. The machine has a 75-hp headstock; it will handle peak loads up to 100 hp; and it has 24 spindle speeds in true geometric progression from 6 to 750 rpm. It has a capa-

Buck AJUST-TRU CHUCKS

Chuck "teamwork" that gives real precision



The Ellis Dividing Head is made for precision operations. The Buck 3-jaw chuck adjusts to dead true precision in 1 minute. Put the two together and you have a real performing team.

Buck Ajust-Tru chucks — 2-jaw, 3-jaw, 6-jaw — provide dead true precision and *guarantee precision within .0005" on production runs!* They help you make the most of every tool's or machine's precision capabilities.

It pays to chuck with Buck!
NEW '57 CATALOG
ready—send for your copy

BUCK TOOL COMPANY
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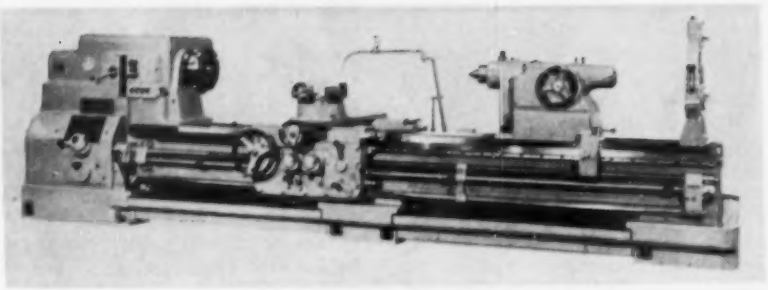
FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-5-187-2

city of 40 in. of swing over the bedways and 25 in. over the cross slide. A horsepower meter is located on the headstock to enable the operator to determine what hp is being consumed during the turning operation.

Two levers control selection of feed changes on the totally-enclosed gearbox. There are 81 feeds, ranging from 0.005 to 0.351 in. per spindle revolution; 45 threads, from 1 to 30 per in. can be cut.

All controls for operating the carriage are located on the apron. Controls for both cross and longitudinal feeds are through easily operated drop levers. Longitudinal rapid traverse, in either direction, is controlled from the left side of the apron. Headstock control to start, stop and reverse the spindle, is on the right side of the apron, in addition to the controls at the headstock station.



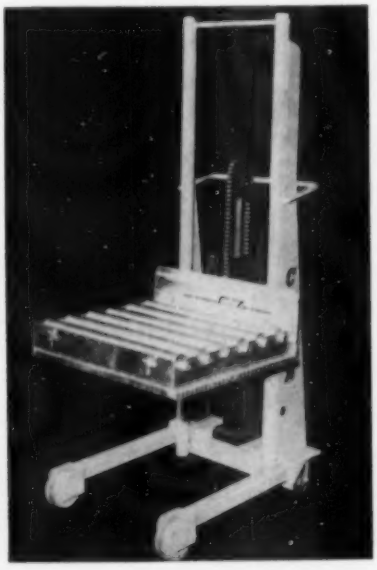
The 2-speed tailstock provides either fast or slow rate of movement.

Axelson Mfg. Co., Div. of U. S. Industries, Inc., 5947 Sheila St., Los Angeles 22, Calif. **T-5-46**

Die Handling Lift

Manually-operated hydraulic lift is designed especially to simplify the handling of dies and similar loads.

Available in either 500 or 1000-lb capacities, this E-Z lift has a special die-handling table which is fitted with six easy turning, full-width rollers. In operation, the lift is moved into position at the machine or in the die storage area, the table is elevated to the proper height, and the die rolled into the proper position on the table for moving. The front of the table has an adjustable steel retainer to keep the die safe and



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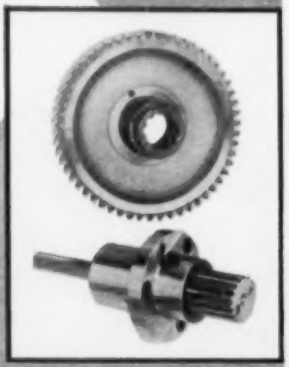
Splinemaster

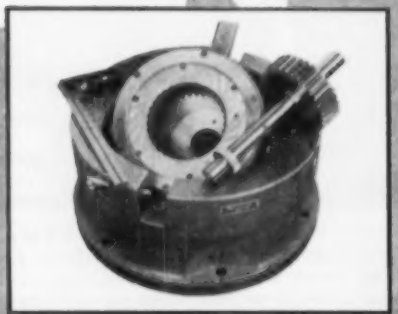
Pitch Line Concentricity Arbors and Chucks

For Automotive and Aircraft Gearing—and all other types of work where Pitch Line Control is required for Production or Inspection Purposes

Engineered for your particular application . . . whether spindle mounted, face plate, between centers, or inspection gauges . . . SPLINEMASTER Arbors and Chucks permit duplicating the same mating condition set up in application of gear train assembly in machining of parts. They also are designed for manual or Draw Bar operation . . . assure three point bearing 100% tooth contact . . . hold gears absolutely rigid from the pitch line; Arbor sizes from point .500 pitch diameter up—smaller sizes for light machining and inspection operations.

Shown here—SPLINEMASTER 180° Indexed Chuck with Aligning Bar, Pitch Line controlled, for use in Aircraft Field. Operation—Grinding Bores on Both Ends and Face.





SPLINEMASTER Arbor, Draw Bar Actuated: For Turning, Facing and Chamfering Operations on Automatic Lathe for part shown here. (Line Pressure 20 Lbs.)

SPLINEMASTER PRODUCTS COMPANY

6781 Maxwell • Van Dyke, Mich. • SLocum 7-3400

Detroit Sales Office: TUxedo 4-4270

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securely on the lift during moving.

The lift has an easy-to-operate hydraulic lifting mechanism, automatic protection against overloads, safety guards and unusual maneuverability with short turning radius. Its lifting range is 7 in. above the floor to 57 in. above the floor.

Crown Controls Co., Inc., New Bremen, Ohio. **T-5-47**

Heavy-Duty Drill

A 1000-rpm heavy-duty drill with ½-in. Jacobs chuck develops 22 ft-lb of torque. Weighing only 9 lb, this Model H drill features subassembly construction to simplify servicing.

The gear case can be removed without disturbing the motor, or the motor can be removed as a unit without disturbing the gear setup. To balance the

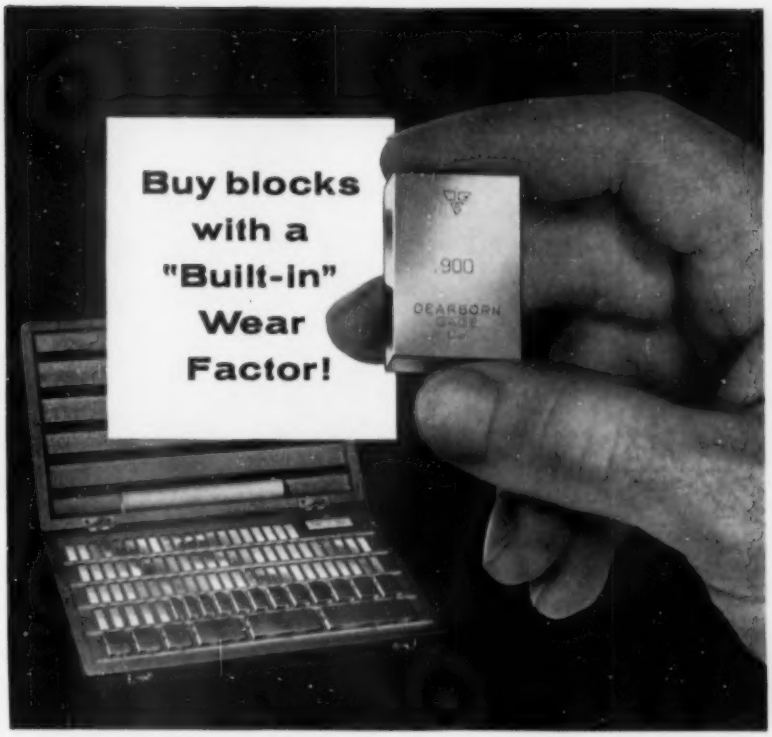
load, a three-gear planetary system is used. This also permits the sun gear to be threaded for easy replacement.

Design of the drill includes a boss for attachment of a ½-in. pipe to offset torque, a protected positive acting governor, positive oiling system, and double-acting throttle which can be easily regulated for smooth operation. The spindle is offset 1¼ in. on top and side, with provision for easy mounting for special applications.

Speed Tool Co., 1502 W. Slauson Ave., Los Angeles 47, Calif. **T-5-48**

Deep-Throat Press

Model BD-3, designed for small tonnage operations, will perform up to 300 operations per minute on continuous punching, forming, blanking, cutting, drawing, shearing, riveting, etc. in metal, leather, plastics, fiber, textile,



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Here at last are gage blocks with a positive "built-in" wear factor! The only blocks ever produced and priced as standard with dimensional accuracy unconditionally guaranteed to be within specified millionths on the "plus" side of nominal block size and minus "zero" . . . absolutely nothing . . . undersize!

This complete elimination of the conventional minus tolerance gives you, the gage block user, three new and exclusive benefits. First, it provides positive assurance against receiving new blocks that are actually "worn" undersize during manufacture before they are ever used. Second, it gives you finer, more practical accuracy . . . with the sure knowledge that every Ellstrom block you buy will start wearing *toward* its nominal size rather than away from it. And third, it gives you a guaranteed minimum wear factor equivalent in millionths to the full minus tolerance specified as standard for all other makes of blocks!

Write for descriptive literature containing complete price information today!

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"W"—WORKING ACCURACY BLOCKS
Measured Length: +.000008"/−.000000"
Parallelism: .000004" Flatness: .000004"

"I"—INSPECTION ACCURACY BLOCKS
Measured Length: +.000004"/−.000000"
Parallelism: .000003" Flatness: .000003"

"L"—LABORATORY ACCURACY BLOCKS
Measured Length: +.000002"/−.000000"
Parallelism: .000001" Flatness: 000001"

Ellstrom—your best buy in gage blocks for shop and tool room use, inspection and laboratory applications. Available in 28 standard sets ranging from 8 to 92 blocks in both square and rectangular styles with or without basic gage block accessories.

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-5-189

paper or any workable material within rated capacity. The press, which has a 12-in. throat, can punch to the center of a 24-in. circle.

It offers quick-action, single-pin clutch with simple, positive, nonrepeat or repeat action. Straight ram guides with flat gib assure accurate fitting of dies for precision stamping. Accurate ram adjustment has simple, positive lock.

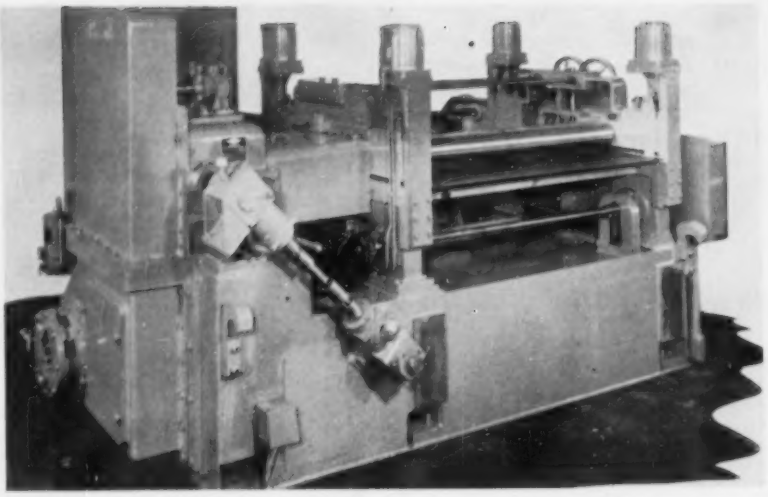
Standard stroke is ¾ in. with ¼ to 1½-in. strokes available at an additional charge. Weight is 182 lbs. V-belt drive requires only ⅓-hp motor.

Alva Allen Industries, Clinton, Mo.
T-5-49

Press Feeder

Mechanically-controlled, automatic feed line for either blanking or progressive die presses feeds lengths as long as 60 in. of 0.125 by 60 in. wide stock.

The unit consists of a coil holder, a decoiling unit and a mechanically-controlled feeder unit. In cases where a scrap skeleton must be disposed of a scrap shear is placed on the exit side of the press with entry feed rolls synchronized mechanically with the feeder



by a line shaft.

The line is applicable without modification to both progressive die operation and straight blanking work, and is electrically synchronized with the press.

For progressive die stamping, the feeder unit has built-in roll release and anti-backup rolls. All rolls in the feeder unit are driven from a heavy-duty gear transmission through universal joint coupling bars.

Strip flatness can be controlled by adjusting the built-in roller leveler. A slight up-curl can be rolled in to prevent the stock from "hanging up" in the dies.

McKay Machine Co., Youngstown, Ohio. **T-5-50**

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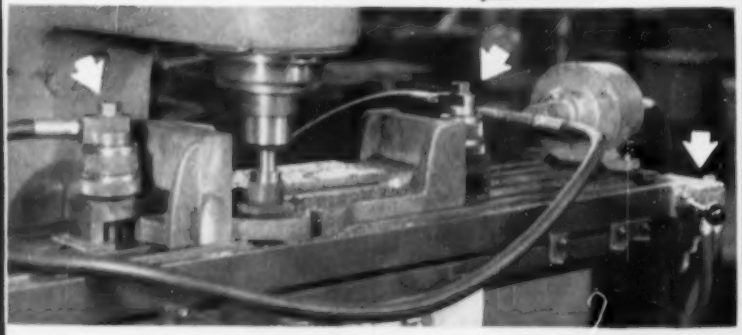
PowRlock gives this hand a 6000 lb. GRIP!



PowRlock AIR-HYDRAULIC CLAMPS provide instant automatic clamping on most existing machines and fixtures. Eliminate nuts, bolts, manual tightening, slash "reloading" time. Hydraulic pressure in the head activates a piston, which exerts up to 6000 lbs. locking force at one to 4 points. Comes complete with air-hydraulic system in 14 models. UNCONDITIONALLY GUARANTEED!

ATTACH THIS AD TO YOUR LETTERHEAD FOR FREE DEMONSTRATION OR LITERATURE.

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SCHILLER PARK, ILLINOIS
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TE-5

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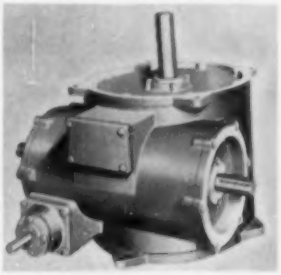
Cam-Operated Indexing Unit

Designed to provide precision positioning between automatic production stations or to provide a simplified means of timing production operation drives, this cam-operated indexing unit has an input of either ¾ or 3 hp, depending



upon the production per hour. Worm reduction can be supplied 10:1, 20:1 or 40:1.

Increments of 8, 12, 16 or 20 can be obtained during one complete cycle or revolution of the index table. Accurate positioning for such operations as milling, grinding, drilling, threading, soldering, crimping or assembly is provided at each index position.

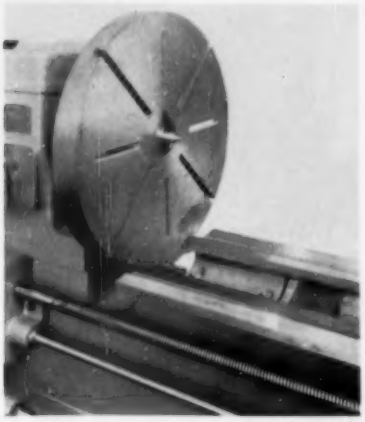
Worm and gear connections to the

input shaft, drive the cylindrical cam, which in turn provides motion to the indexing table. Camshaft extensions provide a simple means for operation of auxiliary drives or other production devices.

Standard Tool & Mfg. Co., 237 Laurel Ave., Kearny, N. J. **T-5-51**

Removable Block for Lathe

Block for Nebel removable block gap lathes is designed so that when the block is in place on the bed, a gap is intentionally left in order to accommodate the large faceplate. Thus the plate can be used for all chucking jobs. Be-



cause the block does not fit snugly against the headstock, it is unnecessary to also provide a small faceplate.

There is no sacrifice of gap turning space as the distance from faceplate to end of gap remains unchanged.

Nebel Machine Tool Corp., 3497-A Central Pkwy., Cincinnati 25, Ohio **T-5-52**

Hydraulic Miller

Double-column hydraulic production milling machine, called Hy-Flex, permits mounting of heads in the required position for milling, drilling, grinding, boring or special applications. Column tops are finished machined, approximately 12½ in. square.

The machine may be operated with heads leading or opposed to each other —in line with, tilted above or below the horizontal plane. Worm gear drive permits swiveling the heads independently to any fine degree of elevation desired. The heads pictured, or other combinations, are available with the machine. Those pictured have 5½ in. of quill travel, with accurate quill adjustment assured by use of dial indicator and

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VULCAN Tool Steels get results:

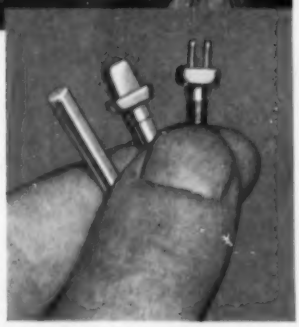
Production up, costs down

A major tool steel user—H. M. Harper Company—recently came up with a real "toughy": Dies for cold heading slotted, hard-to-work Nickel terminal screws. Harper tested steels of various analyses for the application. They found that Vulcan Special Vanadium filled the requirements exactly.

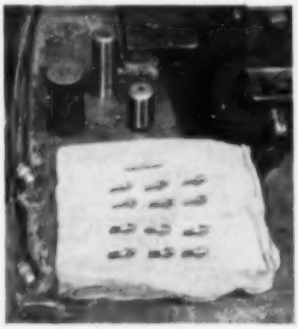
The result—terminal screws produced by cold heading process instead of milling—at very substantial increases in production and much lower cost.

Vulcan representatives *like* tough problems. They welcome highly-demanding tests of Vulcan tool steel superiority. They enjoy tackling a variety of problems, because Vulcan's complete line of fine quality tool steels allows them to give *right answers*—not "almost as good" recommendations.

A representative is nearby to serve you. *Vulcan Crucible Steel Division, H. K. Porter Company, Inc., Aliquippa, Pa.*



VULCAN Special Vanadium used for cold heading dies that are tough enough to produce slotted Nickel terminal screws at H. M. Harper Company, Morton Grove, Illinois.

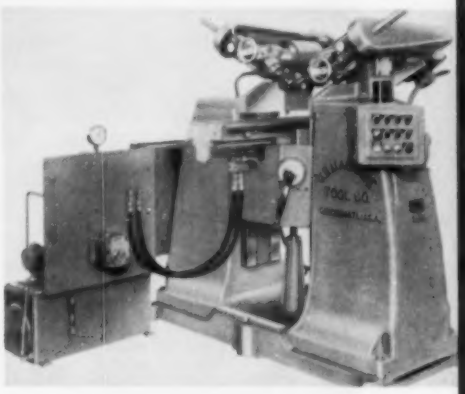


HKP VULCAN CRUCIBLE STEEL DIVISION
H. K. PORTER COMPANY, INC.
FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-5-192

end measuring rod.

Another of the commercial milling and/or grinding spindles which may be installed on the Hy-Flex is a vertically mounted 7½ hp, #50 taper, 1800 rpm motorized milling spindle secured to a bridge based on both columns. With this application, the user has the equivalent of a heavy duty #2 vertical production milling machine with the required high spindle speed unobtainable on a standard milling machine.

Just as simply, the Hy-Flex may be equipped with four independently mo-



torized high-speed grinder spindles horizontally mounted, two on each base. knee, which has 15 in. vertical travel, is center-positioned above the vertical screw. The table has a 30 in. max table stroke, adjusted by movable dogs; infinitely variable feed rate; forward and return job; and automatic or semiautomatic cycling of rapid traverse, feed, return and stop. Independent controls for table feed and head operation are mounted in a control panel separate from the machine.

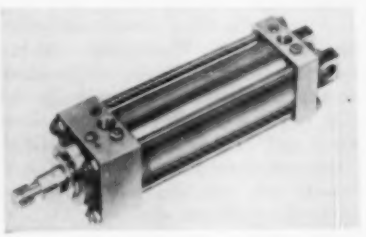
U. S. Burke Machine Tool Div., 16 Brotherton Rd., Cincinnati 27, Ohio

T-5-53

Power Cylinder

Squarehead S line fluid cylinders, rated at 250 psi for pneumatic use or up to 1000 psi for hydraulic are available in 7 bore sizes up to 6 in.

Rod ends of these cylinders incorporate a quick-change rod cartridge. After removing one screw the rod car-



tridge can be removed to allow for quick replacement of a worn rod seal or the rod cartridge itself.

Other features of the cylinder design include chrome plated steel tube, chrome plated manganese steel piston rod, prestressed tie rods for equal load distribution, full floating cushions to avoid misalignment and provide good fit between cushion members.

The cylinders are designed and built to JIC recommendations with standardized mounting dimensions.

Teer-Wickmire & Co., 1935 Wildwood Ave., Jackson, Mich. **T-5-54**

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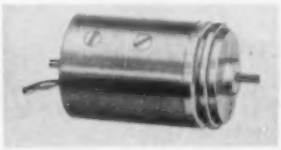
Bi-direction Motor

Output shaft of this stepping or digital motor is positively locked into position after each actuation and cannot be rotated by external forces. Angular accuracy is within ± ½ deg. Although it is ordinarily manufactured to move bi-directionally in 36-deg steps (10 steps per revolution), it may be supplied in other configurations. Maximum pulse



rate is up to 60 per second. Torque is approximately 5 in-oz in the 1½-in. diam x 2½-in. length motor. Larger size motors have correspondingly larger outputs, and the motor can be built to most torque output requirements.

The motor is completely balanced and meets standard shock and vibration requirements.

Nemeth, Inc., 2223 Carmelina Ave., Los Angeles 64, Calif. **T-5-55**

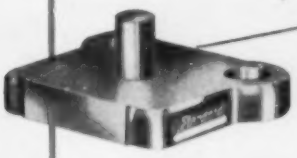
Adjustable-Speed Drive

Any speed in its range can be maintained within ¼ of 1 percent accuracy by this adjustable-speed drive, regardless of load fluctuations. Although designed primarily for U. S. Varidrive motors used for testing aircraft components, this speed-sensitive control can be adapted to any variable drive for industrial applications requiring exact speed regulation.

This packaged system consists of a Varidrive variable speed motor or Varidrive Aero test stand and the new speed sensitive Varitrol automatic control package. The control operates on a tight-loop, high-response, feedback

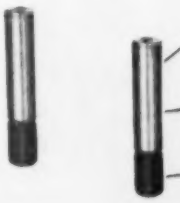
Stan the die set man says:

These details make the difference...



Punch and die holders fully stress relieved — when you lay out work on a "Standard" die set, the dimensions "stay-put" because "Standard" uses a metallurgically correct stress relieving process which produces great dimensional stability.

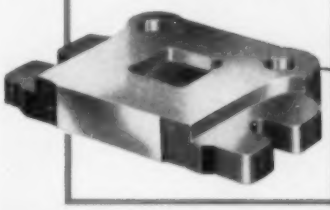
Bushings — hardened, ground, and honed — provide full-length bearing for longer wear. Pre-shrunk in deep freeze for stress-free assembly into punch holder.



McVey Design Precision Posts (pat. applied for) for fast, easy assembly and disassembly of die sets — without hammering or pounding.

Posts chrome-coated for low friction and long wear.

Posts pre-shrunk in deep freeze for precision assembly into die holder holes. Bond of post in plate helped by Pentrate finish of post end.



Special Machine Work further stress relieved for added assurance of dimensional stability and precision fit of posts and bushings.

Send for Die Set Comparison Chart and see for yourself why experienced tool and die makers specify and insist on "Standard" every time.

YES, there's a difference in die sets and "Standard" *makes the difference!*

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STANDARD DIE SET MFRS., INC.
1487 ELMWOOD AVENUE
PROVIDENCE 7, R. I.

☐ Please send Comparison Chart
☐ I would also like a FREE sample of "Standard" die makers grease.

Name .....
Company .....
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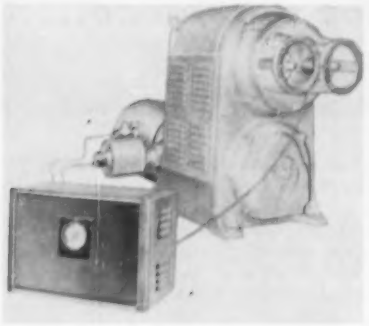
New York • Philadelphia • Buffalo • Detroit • Grand Rapids • Indianapolis • Louisville

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-5-193

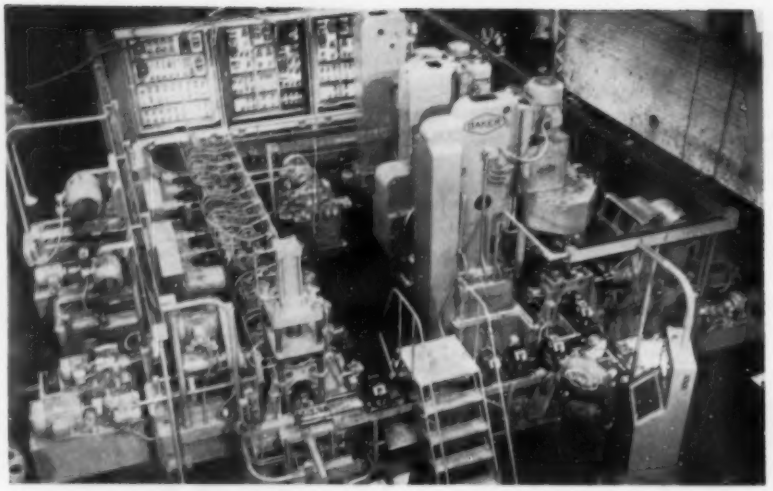
principle. Pneumatically operated it offers simplicity of construction and operation, minimum maintenance and explosion-proof characteristics.

The controls are available from 1 to 60 hp. Aero test stands can be supplied from 1 to 75 continuous hp and to 100 hp for intermittent duty with speeds



up to 15,000 rpm. Aero test stands are provided with one or two mounting pads for direct connection of such air-borne equipment as alternators, hydraulic pumps, fuel pumps, etc.

U. S. Electrical Motors Inc., Box 2058 Terminal Annex, Los Angeles 54, Calif. **T-5-56**



Standard Automation Parts

Line of standard components for automatic equipment is offered to reduce engineering and manufacturing costs of automation.

The complete line includes components for Baker hydraulic machines that perform drilling, boring, facing, chamfering, tapping and other operations. There is a series of hydraulic slides, drive boxes, and power sources for hydraulic feed.

Special components such as some heads and tooling are added as necessary.

Fully automatic transfer machine shown in the illustration is made up from standard components plus special tooling and transfer devices.

Baker Brothers Inc., Toledo 10, Ohio. **T-5-57**

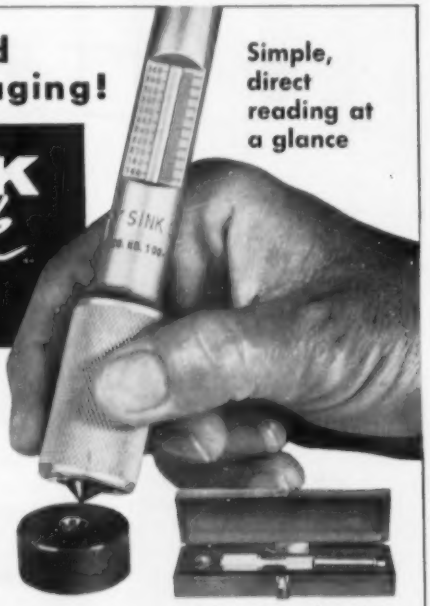
Accurate, Rapid Countersink Gaging!

TRULOK *Countersink* **GAGE**

Simple, direct reading at a glance

This gage is an accurate high-precision instrument which requires no special skill or technique to use. The scale reading is direct with large .005" divisions, can easily be read within .001" tolerance. Made of HSS, in satin finish.

Set includes Calibration Block and handy Contour Gage for monitoring countersink drilling.



Trulok set is packaged in handsome, rugged, lined case.

The **TRULOK** is manufactured by **TRIO PRODUCTS** exclusively for

National Distributors
E. H. STAU CO.
351 S. Atlantic Blvd., Los Angeles, Cal.
AN. 3-3877

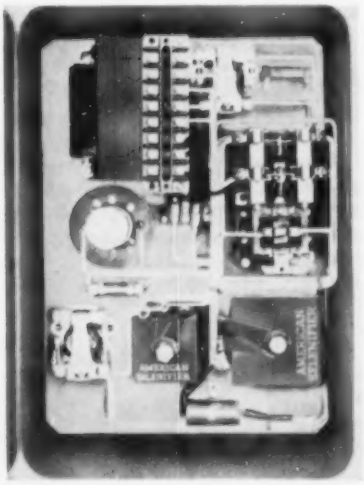
FOR FURTHER INFORMATION, USE READER SEARVICE CARD; INDICATE A-5-194

Electric Brake

An all-electric brake for use on ¼-hp to 250-hp a-c motors can repeat its stopping cycle any number of times without variation in braking torque.

It can be supplied for any voltage up to 600, either 60, 50 or 25 cycles. No connection is made to the motor itself. The brake, called Selenibrake, is applied to the standard starter of the motor by six connections.

Braking torque can be adjusted over a wide range to meet the application's requirements. The brake can be applied



to any motor starter at any time. It is safe and can be applied to single-phase or three-phase motor with slight modification in internal connection.

The Selenibrake is housed in standard metal enclosures for mounting adjacent to the motor. Oil mist or dust will not affect its operation. An electrical lock which is released only when the operator presses the starter button, is available as optional equipment, as are magnetic starters.

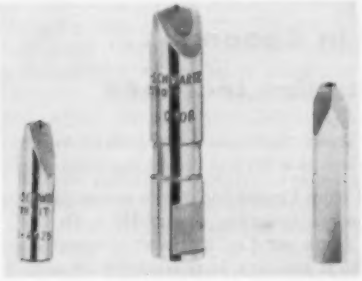
Selenibrake Div., American Rectifier Corp., 95 Lafayette St., New York 13, N. Y. **T-5-58**

USE READER SERVICE CARD ON PAGE 169 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

Diamond Tools

Specially processed, shaped diamond dressing tools are designed to permit reproduction of pine tree and other root sections of jet blades and buckets on two-wheel precision form grinders.

Illustrated are three types of special jet tools: Jones and Lamson NX-976-1 with 0.017 in. radius; Pratt and Whitney Dia-Form with 40 deg included angle and 0.010 in. radius; and Ex-Cell-O 48-4428.



Characteristic of these tools is the triangular-shaped macle diamond used. A special powder metal matrix material was developed to hold this special diamond securely centered in the tool shank.

Craine-Schwartz Diamond Tool Co., 8100 Lyndon, Detroit 38, Mich. **T-5-59**

Film Gage

Plating and film thickness on conductive materials can be measured quickly and precisely by the film gage, Type 255-A.

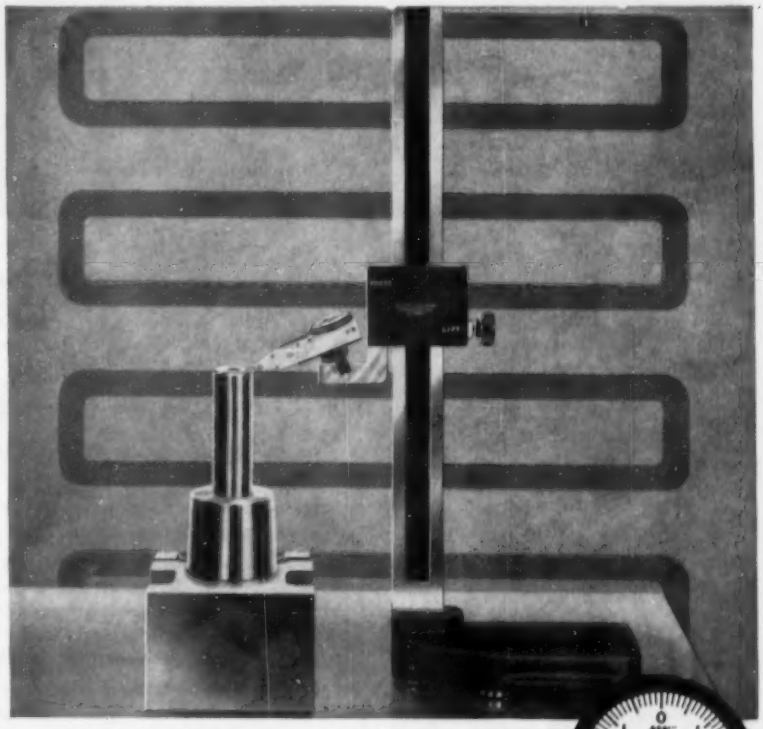
This electronic instrument may be used to measure protective coating thickness of anodic films on aluminum, magnesium, and other nonmagnetic basic metals.

It also provides a practical aid in sorting metals in accordance with their electrical conductivity and in matching

metals in accordance with their magnetic properties.

It may be used for measuring the film thickness of nonmagnetic platings such as silver, gold, cadmium, chromium, rhodium, etc., on such nonmagnetic metals as copper, brass, aluminum, and for measuring the thickness of conductive, nonmagnetic materials such as copper on insulating materials such as glass, phenolic sheet material, ceramic.

Boonton Radio Corp., Boonton, N. J. **T-5-60**



New CHECK MASTER (in special, rigid C-M Height Gage) responds to variations of .000020", repeats without visible error.

NOW All CHECK MASTERS are Non-Magnetic, Lower Priced

MAGNETISM is fine in a holding chuck, but not in a precision test indicator. Undetected, even for a short time, it can cost real money in false rejects or parts incorrectly passed.

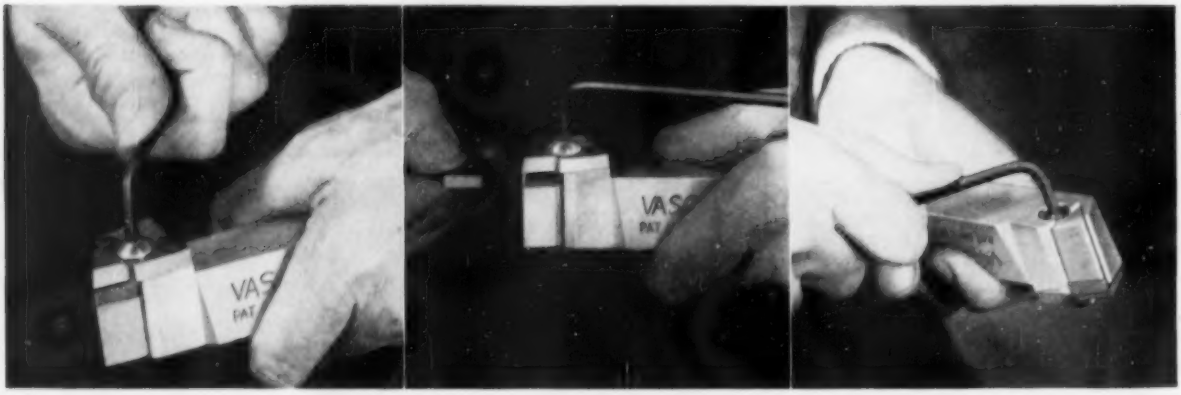
Now, all CHECK MASTER Test Indicators are *non-magnetic* and *gold* in color to identify their supreme accuracy even in the strongest magnetic fields. They are the finest instruments of their kind available, yet all six improved, *non-magnetic* models are now *lower priced*. Ask the *Man-from-Standard* or write Standard Gage Company, Inc., for Bulletin giving full details.

STANDARD Gages POUGHKEEPSIE, N. Y.

A COMPLETE LINE OF GAGES . . . INDICATING, FIXED AND ADJUSTABLE LIMIT TYPES

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-5-195

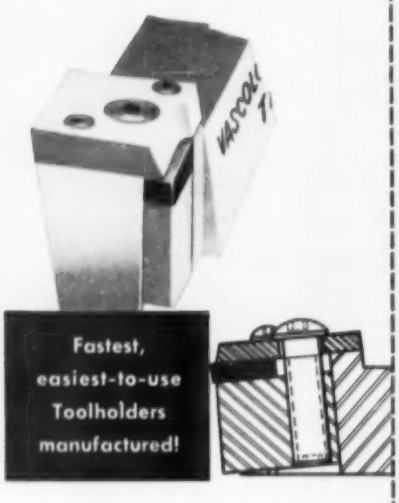
How V-R Toolholder Design Reduces Costly Downtime



1. Insert is clamped in position or released by a turn of the main screw which raises or lowers the exclusive V-R elevator...the single moving part. Nothing to fall out or fumble with.

2. Insert is indexed or replaced in seconds. When you clamp the insert against the chipbreaker plate, it always comes back to the setting, regardless of the thickness of the insert.

3. The main screw is also adjustable from bottom for easy change of inserts when the toolholder is in an inverted position. Another V-R exclusive design feature.



The main screw controls the exclusive elevator. The chipbreaker plate forms the top anvil against which the insert is clamped.

Cutting Edges Changed In Seconds . . .

User Reports 55% Production Increase

The toolholder and clamped-in carbide insert principle continues to make major savings everywhere it is applied. Here is a typical recent example:

A Rockford, Illinois, company changed from brazed tools on a turret lathe to a V-R toolholder with throw-away inserts. Grinding of carbide tools for this machine, which formerly took 2 to 3 hours per day, has been eliminated. Machine downtime, formerly about one hour per day, is now about 10 minutes. Production has been increased 20 to 25%!

V-R toolholder design has carried the toolholder principle to maximum effectiveness. A single main screw is the only adjustment. Chipbreaker plates are available ground to a standard chipbreaker width or to a specified width at no extra cost. They are also available with zero chipbreaker width for the customer to grind to his own specifications.

All toolholder parts are interchangeable and replaceable.

Both negative and positive rake holders are available to handle 90% of jobs that can be handled by brazed tools.

On job after job, V-R toolholders have proven to cost less to use than brazed tools or any other toolholder. Investigate—get the facts.

Ask for CATALOG VR-437

Call your V-R Representative or Distributor, or write:

MANUFACTURERS OF:
CEMENTED CARBIDES, TOOLHOLDERS and TANTUNG® CAST ALLOY CUTTING TOOLS

Vascoloy-Ramet Corporation
SUBSIDIARY OF FANSTEEL METALLURGICAL CORPORATION

842 Market Street • Waukegan, Illinois

TH-616R

Men at Work

Among officers elected for Waterbury Farrel Foundry & Machine Co. at the recent meeting of the board of directors were **F. S. Van Valkenburg**, who was made chairman of the board and a vice-president of the company, **A. D. Mitchell**, who became president of the firm, and **R. C. Bannon** and **Tadeusz Sendzimir** who were made vice-presidents. Mr. Sendzimir also will continue as manager of the recently acquired Sendzimir Cold Rolling Mill Div.

At Chrysler Corp., **Vincent P. Masi** was named manufacturing manager of the Mound Road engine plant and **Howard H. Schrock** was made manufacturing manager of the Trenton engine plant. Both men will be directly responsible to the respective plant managers for production activities, control and engineering. Mr. Schrock is a member of ASTE's Detroit chapter.

Lees-Bradner Co. recently announced four promotions. **Don Goodwill** was made chief engineer, and **Ted Masaitis** was moved up to chief of the machine design section. **Anson Laufer** became head of the company's Cri-Dan Div. and **John Montean** was promoted to assistant of the division. Both Mr. Laufer and Mr. Montean are members of ASTE's Cleveland chapter.

Election of **Glenn P. Bakken** as president of Chase Brass & Copper Co., Inc., subsidiary of Kennecott Copper Corp., was recently announced by the parent company. Mr. Bakken has been executive vice-president of Chase since joining the organization in January 1955.

John J. Bachner has been elected president of Chicago Molded Products Corp. Executive vice-president and general manager of the firm since 1954, he now succeeds Marcel F. Bachner who died early this year.

Recent election made **George R. Quaile** president of Pittsburgh Stencil & Tool Co. **H. C. Rickenbach**, company founder, and **P. J. Rickenbach** are now associated with the firm as full time consultants.

Ardon B. Judd has been elected president of Southwest Fabricating & Welding Co., a subsidiary of Walworth Co. **Fred W. Belz**, president of the parent company, becomes chairman of the board of Southwest.

Thomas M. Ryan is now vice-president and general manager of Press Automation Systems, Inc. He has been manager of Sahlin Engineering Co. since 1950.

John C. Wallace was recently named vice-president of engineering and **Frederick M. Jackson** was made vice-president in charge of sales for the Walworth Co. Mr. Wallace was formerly vice-president and general manager of Hunt-Spiller Mfg. Co. Mr. Jackson, who has been associated with Walworth since 1926, has been vice-president for oil and gas industry sales since 1952.

Appointment of **Donald C. Campbell** as works manager was announced by The Skinner Chuck Co. Mr. Campbell, who formerly was works manager at Whirlpool-Seeger Corp., will be responsible for manufacturing operations in Skinner's chuck and electric valve divisions.

Appointment of **Carl B. Wooten** as executive vice-president has been revealed by Trecker Aircraft Corp. He previously was sales manager of Aero Design & Engineering Co.

Two promotions at Denison Engineering Div. of American Brake Shoe Co. made **Leroy E. Bonnette** the division's chief engineer and **Carl W. Lindahl** its director of purchasing. Mr. Bonnette has been chief development engineer and Mr. Lindahl was executive assistant to the director of engineering.

J. C. Drader has been named to fill the recently created post of vice-president-research at Michigan Tool Co. Mr. Drader has been with Michigan since 1916, shortly after it was formed, and has been a vice-president since 1941.

Stewart G. Fletcher has been made vice-president-metallurgy for Latrobe Steel Co. Associated with the company since 1945, he has been its director of metallurgy for the past year. He is a member of ASTE's Pittsburgh chapter.

S. J. Hunt is now vice-president in charge of engineering for National Automatic Tool Co., Inc. Since joining Natco in 1947, he has been administrative engineer, assistant chief engineer, and, most recently, director of research and development.

Revis L. Stephenson is new executive vice-president of U. S. Hoffman Machinery Corp. He will retain his directorship of Hoffman Foreign & Export Operations and supervision of the Industrial Divs. in addition to his new responsibilities.

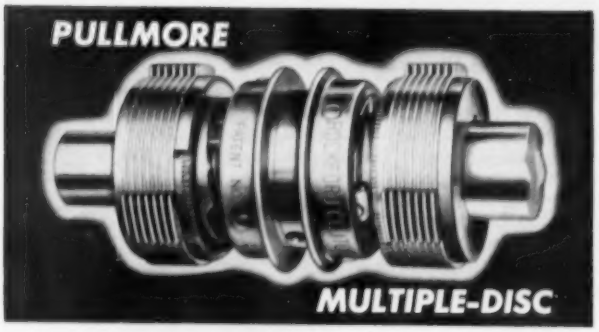
Industrial Tectonics, Inc. announced appointment of **Dalton H. Miller** as general manager for its recently completed special bearing plant in Compton, Calif. Mr. Miller formerly was consulting engineer for Albert Ramond and Associates.

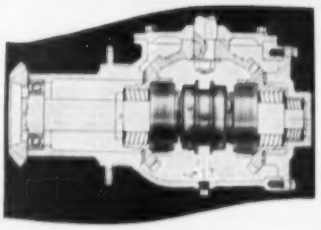
The Teller Co. has appointed **Charles L. Zoltani** chief engineer for its special machinery Div. For the past five years he has been project engineer for H. H. Robertson Co.

A. J. Williamson (left), formerly executive vice-president of Tube Reducing Corp., has been elected to the office of president.

Hugh V. Allison (right) president and general manager of Allison Div., American Chain & Cable Co., Inc., now also fills the newly created post of general manager of ACCO's Campbell Machine Div.

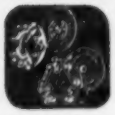
ROCKFORD

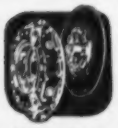




CLUTCHES (Single or Double) PROVIDE

COMPACT Design


Small Spring Loaded


Heavy Duty Spring Loaded

Oil or Dry Multiple Disc

Heavy Duty Over Center

Power Take-Offs

Speed Reducers

COMPACT DESIGN
HIGH TORQUE
HIGH-RATIO LEVERS
POSITIVE NEUTRAL
PRECISION BUILT
LONG WEAR LIFE
EASY ADJUSTMENT

These compact, powerful, multiple-disc clutches are helping product engineers reduce size and weight between the driving and driven units of machine tools, lift trucks, overhead cranes and a wide variety of other equipment. Readily fit into product designs, accommodating great torque capacity within small size. Precision grinding insures perfect fit on the shaft.

Send for This Handy Bulletin

Shows typical installations of ROCKFORD CLUTCHES and POWER TAKE-OFFS. Contains diagrams of unique applications. Furnishes capacity tables, dimensions and complete specifications.

ROCKFORD Clutch Division BORG-WARNER

1329 Eighteenth Ave., Rockford, Ill., U.S.A.

Export Sales: Borg-Warner International — 36 So. Wabash, Chicago 3, Ill.

CLUTCHES

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-5-198

Al Minetti, vice-president of the Harron, Rickard & McCone Co., is on loan from his company for about six months to serve as consultant to the Metalworking Equipment Div. of the Business and Defense Services Administration of the U. S. Department of Commerce. He will pursue a study of the government's tool and machine tool replacement programs and also will assist on problems involving secondary metal-forming equipment. Mr. Minetti is a member and past chairman of ASTE's Golden Gate chapter.

Five appointments were recently made in the engineering department of Seneca Falls Machine Co. **Robert R. Wilmarth,** who had been with the manufacturing service division of General Electric Co., joined the staff of Seneca Falls as assistant chief engineer. **Fred J. Oster,** formerly with the Detroit Transmission Div. of General Motors Corp., was made acting chief sales engineer. **Arthur S. Dinsmore,** who has been responsible for design of automation handling equipment at Seneca Falls, was promoted to engineering design supervisor. **Joseph W. Skinner,** formerly with the machine tool division of Ex-Cell-O Corp., was made engineering detail supervisor. **Alan Reynolds** who has been responsible for electrical, hydraulic and pneumatic circuitry, was moved up to acting engineering electrical supervisor.

Sterling Tool & Mfg. Co. has announced appointment of **Charles J. Wacker** as sales manager of the stampings division. Mr. Wacker has been active in the business machine and office and factory systems field since 1949.

John N. Kempf is now manager of new product development of adhesives and coatings at Furane Plastics. Prior to this appointment he was associated with United States Stoneware Co. as associate director of the research and development laboratories.

George C. Meibuhr was recently elected vice-president of engineering for Automation Development Corp. He formerly held the position of chief engineer of the firm.

Trade Literature

for free booklets and catalogs—use convenient request card, page 169

Powder Metallurgy

Manufacture and use of powder metal parts are described in detail in "An Engineering Handbook on Powder Metallurgy;" offers advanced technical data on design, engineering and application of bearings, machine parts, infiltrated parts, plated parts and pole pieces made of powder sintered metal; extensively illustrated by photos and drawings. The Bunting Brass and Bronze Co., Toledo, Ohio. **L-5-1**

Lock Nuts

Twelve-page catalog contains American Standard dimension tables on all M-F lock nuts and semi-finished nuts plus engineering data on wrench torques and test procedures for prevailing torque type lock nuts. Illustrated by photos and drawings. MacLean-Fogg Nut Co., 5535 N. Wolcott Ave., Chicago 40, Ill. **L-5-2**

Tube Fittings

Full line of Triple-lok tube fittings in brass, steel, stainless and aluminum covered in 52-page Catalog No. 4310. Each item presented by dimensional drawing and table and described as to use. Tube & Hose Fittings Div., Parker Appliance Co., 17325 Euclid Ave., Cleveland 12, Ohio. **L-5-3**

Pressroom Equipment

Illustrated 16-page brochure presents line of pressroom equipment; features description on patented hydraulic system used in equipment with drawing to show important details. Sesco Inc., 8881 Central Ave., Detroit 4, Mich. **L-5-4**

Heating Devices

Information on heaters and heating devices offered in 16-page publication CEC-1005H which also describes ceramic-to-metal and plastic resin hermetic seals; includes 16-page power requirements section showing short and long form calculations for heating applications, tells how typical application problems are solved; includes data, specifications, operating information, and manufacturer's recommended list prices of standard equipment. General Electric Co., Schenectady 5, N. Y. **L-5-5**

Hard Facing Electrodes

Illustrated 20-page manual, "Rexarc Engineered Toughness," offers comprehensive procedure section on typical buildup and hard facing applications for better wear resistance. Shows recommended application procedures together with type and quantity of material required, and also offers many aids to weldors. The Sight Feed Generator Co., West Alexandria, Ohio. **L-5-6**

Blast Cleaning

Automated techniques for high-speed blast cleaning, construction features of Rotoblast units, layout aids and a special section on abrasive coverage presented in 20-page reference Bulletin No. 703; includes specifications and dimensions of all Blastmaster barrels; illustrating their features and describing advantages. Pangborn Corp., Hagerstown, Md. **L-5-7**

Two COMPLETELY NEW Hammond UNITS
that are making Grinding History!

The new Hammond Electrolytic Oscillating and Chip Breaker Grinders were designed primarily for use with the Anocut electrolytic grinding process. A controlled and precise method, the Electrolytic process removes stock electrochemically. It is not to be confused with electro-spark or electro-arc methods. It reduces diamond wheel consumption 80% to 90%.

Combined with electrolytic grinding, these Grinders provide a tremendous advance in grinding ease, speed and cost reduction.

WRITE FOR FREE LITERATURE

Hammond Machinery Builders INC.

5068 DOUGLAS AVE. • KALAMAZOO, MICHIGAN

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-5-199

reduce
vibration
INCREASE TOOL LIFE

WITH WENDT-SONIS
***NO-CHAT SHANKS**

FOR BORING BARS

GRINDING QUILLS

CUT-OFF TOOL

When tool vibration is reduced, finish is improved, deeper cuts can be made, and taper is eliminated in deep hole boring.

When tool life is increased, costs go down, profits go up.

So you save in many ways with "No-Chat" tool shanks specially engineered to reduce vibration, increase tool life. This very dense, rigid material is available rough or finished in round, square or rectangular stock. The W.S. line of standard "No-Chat" tools includes boring bars and cut-off tools.

For detailed specifications — for technical assistance in using "No-Chat" — see your Wendt-Sonis distributor's salesman.

Send for specification sheets today Dept. TEN-557

*"No-Chat" is a registered trade name of the P. R. Mallory Co.

WENDT-SONIS COMPANY
Hannibal, Missouri • Rogers, Arkansas

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-5-200

Permanent Magnets

Illustrated 12-page catalog, PM-121, covers both cast and sintered permanent magnets; includes information on magnetic and mechanical properties, approximate tolerances, magnet assemblies, sales and service plus ordering information. General Electric Co., Magnetic Materials Section, Edmore, Mich. **L-5-8**

Spectrochemical Analysis

Informative 28-page brochure CH401, prepared by Hilger & Watts, Ltd., describes basic fundamentals of spectrochemical analysis and includes bibliography of pertinent reference material; written in easy to understand language, it outlines methods, instruments and accessories used and includes examples of typical analytical problems, suggested laboratory floor plans and information on special purpose instruments. Information Service, Jarrell-Ash Co., 26 Farwell St., Newtonville 60, Mass. **L-5-9**

Control Systems

Bulletin B91-1 describes electronic load and frequency control systems for captive plant, small utilities and multiple station systems; covers individual servos that form an interlocking, continous chain for cumulative control of all factors. Illustrated with photos and drawings. Industrial Div., Minneapolis-Honeywell Regulator Co., Wayne and Windrim Aves., Philadelphia 44, Pa. **L-5-10**

Drafting Equipment

Checkup list showing every type of product used in modern, well equipped drafting room provides aid for critical review of drafting methods and equipment in order to keep it equipped for top productivity; folder also suggests several ways to reduce waste motion, avoid time consuming methods, reduce fatigue, save space, etc. Frederick Post Co., 3630 N. Avondale Ave., Chicago 18, Ill. **L-5-11**

Resistance Welding

Report on information gained from more than three years of welding research and actual production welding experience by Massey-Harris-Ferguson, Ltd. presented in 16-page issue of Vol. 5, #1 of "Resistance Welding At Work." Discusses how castings, forgings and arc welded parts have been replaced with resistance welded assemblies of standard sheet or bar stock, and screw machine products, pointing out economies and other advantages gained. Sciaky Bros., Inc., 4915 W. 67th St., Chicago, Ill. **L-5-12**

Analog Computers

Questions concerning automation and development of control systems for industrial and military applications are answered in booklet "High-Speed Analog Computers, Key to Rapid System Development"; defines certain types of computers and summarizes applications of each; also gives virtues and limitations of high-speed analog computers as compared with real-time computers; outlines typical fields of application. GPS Instrument Co., Inc., 811 Boylston St., Boston 16, Mass. **L-5-13**

Turret Drilling

Turret drilling technique explained in 20-page case history brochure, "Drama in Drilling," which shows results accomplished on variety of jobs, covers consecutive operations in a single hole location, straight line hole patterns, single and concentric bolt circles, and random hole patterns in one plane and in different planes. Each application illustrated and identified as to material being worked, tooling required and operation performed, and giving actual production time per piece. Request only on company letterhead directly to Howe & Fant, Inc., East Norwalk, Conn.

Screw Thread Standards

Vol. IV, No. 6 issue of Die Headlines, concerned with thread standards, carries Proposed 1957 Revision of Unified and American Screw Threads ASA B1.1, presents major, minor and pitch diameters giving the classes, allowances and tolerances of all internal and external threads up to and including 2 in. Free if requested on company letterhead directly from The Eastern Machine Screw Corp., Truman & Barclay Sts., New Haven 6, Conn.

Cold-Rolled Spring Steel

Complete information and data to help users of spring steel make selections are presented in 48-page manual, "Fact Book of Cold-Rolled Spring Steels." In addition to giving sizes, grades, hardnesses and analyses, brochure offers brief instruction course on spring steel, its essential qualities, various trades and what each is commonly used for; how it is rolled, annealed, slit and filed, hardened and tempered, polished, colored and inspected by this fabricator; gives technical discussion of hardness values, selection of analyses and grain structure, plus practical hints on blanking and forming parts and their hardening and tempering. Illustrated by photos, photomicrographs and physical property charts. Wallace Barnes Steel Div., Associated Spring Corp., Bristol, Conn. **L-5-14**

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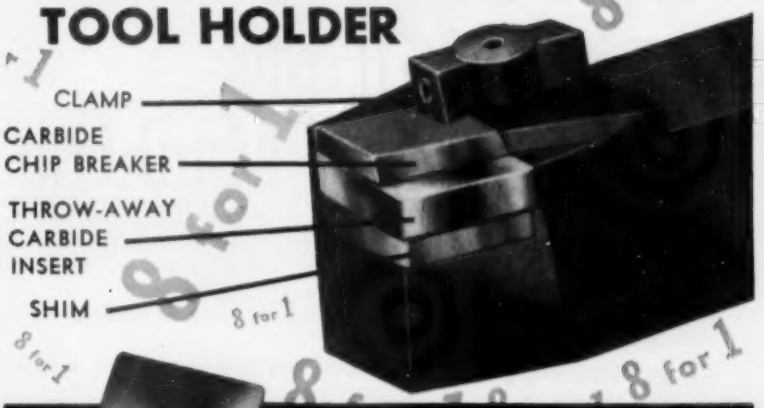
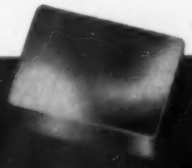
THIS WENDT-SONIS TOOL HOLDER





• • • PLUS ONE INSERT GIVES YOU UP TO 8 CUTTING EDGES

SAVE ON INVENTORY With the wide range of Wendt-Sonis carbide grades and shapes available in throw-away inserts and chip breakers, one tool holder and a stock of inserts can do the work of a much larger stock of brazed single-point tools.

SAVE ON GRINDING With the much lower cost of throw-away inserts, expensive diamond-wheel regrinding is unnecessary.

SAVE ON MACHINE DOWN TIME Because precision-made Wendt-Sonis inserts can be indexed to ±.001", inserts can be replaced without removing tool holder from machine.

FREE TECHNICAL SERVICE in connection with your tooling problems is available from the Wendt-Sonis representative in your area. Ask him for detailed information on Wendt-Sonis tool holders and throw-away carbide inserts or write for Catalog 57-A. Address Department TE-557

WENDT-SONIS COMPANY
Hannibal, Missouri • Rogers, Arkansas

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DIAMONITE OXIDE CUTTING TOOLS

Multiply Production of Machine Tools

Because Diamonite is the hardest, most abrasion-resistant material ever developed for tool service

. . . . . is itself an oxide . . . can't oxidize or "burn up"

. . . . . is chemically inert to surface welding

. . . . . the vitreous non-metallic Diamonite bond withstands higher temperatures and pressures than any other type of bond . . .

Diamonite Oxide Cutting Tools perform successfully at high speeds impossible with other materials.

This is evidenced by results of field tests on actual production operations.

184% INCREASE ON A.I.S.I. 1035
Part: 20" Face of Aircraft Part
Material: A.I.S.I. 1035

	Carbide	Diamonite
Speed, f. p. m.	235	840
Feed, i. p. r.	.033	.016
Depth of cut	.125"	.205"

700% INCREASE ON A.I.S.I. 4145
Part: 1¼"x22" Spindle
Material: A.I.S.I. 4145 H.R. and Annealed

	Carbide	Diamonite
Speed, f. p. m.	700	1400
Feed, i. p. r.	.003	.012
Depth of cut	⅛"	⅛"

150% INCREASE ON A.I.S.I. 1045
Part: 5½" Shaft
Material: Hot Rolled A.I.S.I. 1045

	Carbide	Diamonite
Speed, f. p. m.	250	628
Feed, i. p. r.	.016	.016
Depth of cut	¼"	¼"

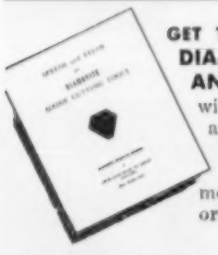
DIAMONITE FOR YOUR WEAR PARTS, TOO

Diamonite's extreme hardness and wear resistance assure extra long life and lowest end cost. Custom shapes can be made to your specifications. Send your prints for quotations.

ANOTHER DIAMONITE FIRST
DIAMONITE *New Superigid* **TOOL HOLDER**

Especially designed for use with oxide cutting tools.

Insures Maximum Performance from Diamonite Oxide Cutting Tools.



GET THIS NEW DIAMONITE SPEED AND FEED CHART
with recommended speeds and feeds for use with Diamonite Oxide Cutting Tools. Ask your Diamonite Tool distributor—or write

DIAMONITE products manufacturing company
Canton 2, Ohio

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Drilling

Booklet discusses advantages of subland two diameter drilling as opposed to step drill two diameter drilling; enumerates steps in manufacturing both type drills, gives maintenance requirements of both; also discusses production records as shown in an independent tool test report in an effort to help user decide which drill should be used. Mohawk Tools, Inc., 910 E. Main St., Montpelier, Ohio. **L-5-15**

High Temperature Alloys

Engineering properties and fabrication characteristics of 10 high strength alloys for elevated temperature service described in detail in 20-page illustrated brochure; also gives recommended uses for each alloy, how to use stress-rupture and creep data in designing components, and describes effect of steelmaking practice on forgeability, a cold working properties and service behavior. The Carpenter Steel Co., 354 W. Bern St., Reading, Pa. **L-5-16**

Tubing

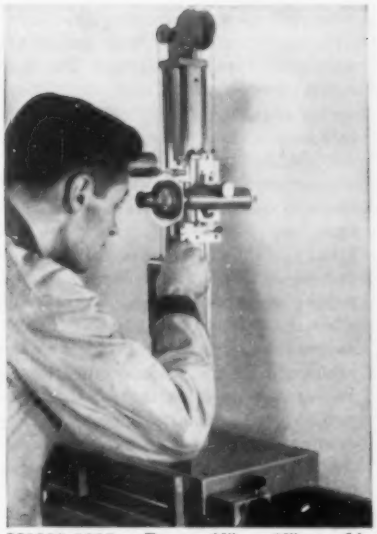
Comprehensive booklet describes tubing, production processing and facilities for handling variety of tubing requirements; flow chart gives pictorial story of tube producing process and photos show sequence of operations involved. Separate sections cover specific types of tubing and list other technical handbooks available for complete information and specifications. Ohio Seamless Tube Div., Shelby, Ohio. **L-5-17**

Treating for Corrosion Resistance

Eight-page bulletin, "Corrosion Resistance of Chromallized Iron and Steel Parts," contains results of corrosion tests run on various Chromallized steels; also includes case histories of successful applications of this process. Chromalloy Corp., 450 Tarrytown Rd., White Plains, N. Y. **L-5-18**

Special Steels

Sixteen categories of special purpose steels including high-speed, tool, stainless, alloy and machinery, available in 16,000 grades and sizes, are indexed in 232-page product and warehouse catalog, "Special Steels for All Industry," describing more than 700 products available from stock at the company's warehouses. Also includes more than 20 estimating, conversions and weight tables plus other information useful to steel users. Request only on company letterhead directly to Engineering Service Dept., Crucible Steel Co. of America, Box 1558, Pittsburgh 30, Pa.



M1238-1818 — *Range 18" x 18", working distance 9" to infinity. Reads to 0.001" up to 24" working distance. Protractor ocular reads to 3 minutes of arc. Image is erect.*

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Coordinate Cathetometers

These convenient, reliable optical instruments permit making precise coordinate measurements in a vertical plane. The two dimensions are measured with one setting, object does not have to be rotated. Inspection time is cut in half and resetting errors eliminated.

Versatile Gaertner Coordinate Cathetometers are ideally suited for precision measurements on large objects; also objects or points in recessed, remote, or inaccessible locations. Applications include measuring jet engine sections, complicated castings, printed circuits, bolt holes and bosses on large piece parts, traces on cathode ray tubes, etc.

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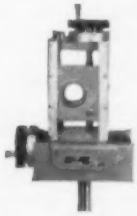
M1236-46— Horizontal range 6", vertical range 4". Reads to 0.0001", working distance 5" to infinity.



M1236-22— Range 2" x 2", reads to 0.0001". Working distance 5" to infinity. Shown with 19 mm mounting rod, and without telemicroscope. Instrument permits precise coordinate movement of other objects such as photo cells, probes, etc., in place of telemicroscope.

Write for Bulletin 188-53

The Gaertner Scientific Corporation

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INDICATE A-5-203-1

abstracts of FOREIGN LITERATURE

By M. Kronenberg
Consulting Engineer

Unbalance in Grinding Wheels

Complete elimination of the unbalance in a grinding wheel is not always desirable say Kienzle and Muennich in an article published in the February 1957 issue of *Werkstattstechnik und Maschinenbau.*

They have considered only static unbalance; that is, unbalance in one plane passing through the wheel square to the axis of rotation, claiming that dynamic unbalance is less significant in the case of grinding wheels. Two-plane unbalance, commonly known as dynamic unbalance, is only to be taken into consideration, in their opinion, when the grinding wheel is wide in comparison with its diameter.

Balance weights must, however, be placed on both sides of the wheel in order to avoid introducing dynamic unbalance. The authors distinguish five types of unbalance; namely, manufacturing unbalance, delivery unbalance, assembly unbalance, shop unbalance, unbalance after repeated balancing. They have also considered the effects of structural unbalance in a grinding wheel caused by differences in density, as contrasted with unbalance due to deviation in shape.

Optimum conditions for the entire life of a grinding wheel are obtained when the original unbalance is reduced only 50 percent. The investigation has been carried out in connection with the preparation of new German standards.

Cutting Forces in Surface Grinding

H. Krug continues his report on cutting forces in surface grinding in the February 1957 issue of *Werkstattstechnik und Maschinenbau.* The author describes the effects of grain, bond and coolant on the cutting forces.

Cutting forces are greatly affected by the bond (vitrified or synthetic) of the wheel. The tangential or main cutting force in surface grinding is more

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Our tough looking character who is holding the smiling baby clearly demonstrates one fact: whenever you are holding *anything* it should be secured with gentle firmness. And this is so true when considering chucking equipment.

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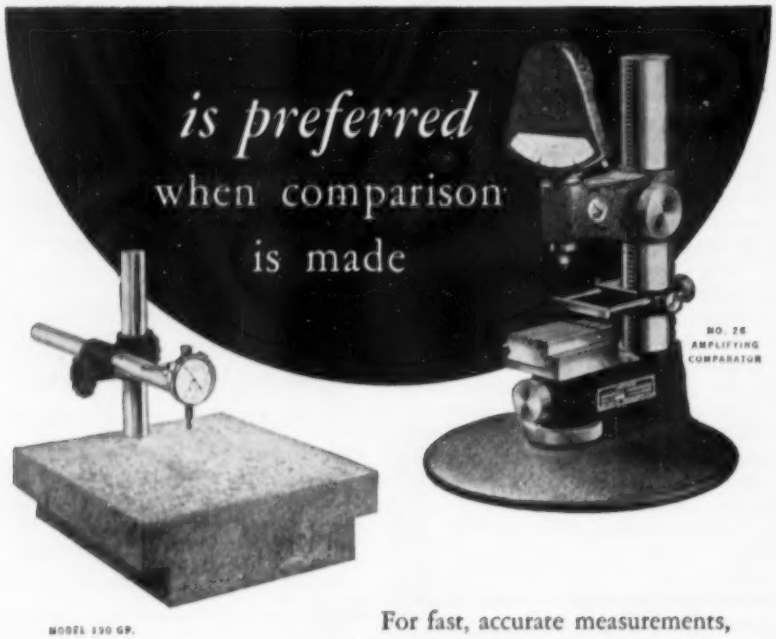
AMES

is preferred
when comparison
is made



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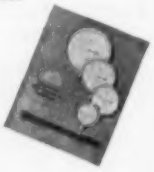
Special comparators are available for measuring resilient materials such as rubber, paper, etc., and for measuring non-yielding materials such as sheet metal, glass and plastic. Write for complete details.



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than 100 percent greater for wheels with synthetic bonds than for wheels with other types of binders. The same result was obtained for the infeed forces requiring higher rigidity of the grinding machine when synthetic wheels are used.

Comparative tests run dry and with coolants on cast iron and steel indicate that less power is required for wet grinding; although the differences are sometimes small, they vary with the cutting conditions, bond, abrasive and other quantities. The infeed forces are reduced to a greater extent by wet grinding than the main cutting forces. The author explains that the abrasive particles are removed slower in dry grinding than in wet grinding and thus clog the pores of the wheel, causing higher infeed forces.

The author also indicates that surface finish produced by wheels with synthetic bond (bakelite, etc.), is often better than that produced by other wheels but at the cost of higher cutting forces, greater power consumption and machines of higher rigidity.

Electrospark Machining

A survey of various methods of electrospark machining is given in Issue No. 12, 1956 of the Swiss magazine *Industrielle Organisation* in an article by H. U. Vogel. It is interesting to note that electrosparking and metal removal by it was observed and described as far back as 1767 by an English priest, philosopher and historian, J. Priestley. The industrial application, however, of this discovery is only 15 to 20 years old.

Machines, principles and methods described in the article include Swiss, American, German and French designs. They are similar in construction and mostly derived from classical drilling machines.

Warm Pressing of Spur Gears

A precision method for pressing of spur gears has been successfully developed by O. Rieckhoff according to his report in the February issue of *Werkstattstechnik und Machinenbau*. The aim of the method is to reduce the machining of spur gears by warm pressing them and to shave them afterwards. In this way, it is claimed, it is possible to reduce cost and increase accuracy of gear manufacturing.

The author describes his tests, which were carried out in cooperation with a large German company, on test-gears having external teeth and internal splines. The gears were delivered to the press with 0.080 inch of stock. After pressing, the error in pitch did not exceed 0.004 inch and averaged about 0.0016 in. The error was reduced to 0.0008 inch by shaving.

An important item for successful pressing of gears is the proper design of the die. It was found by experimentation that it was necessary to distort the master gear and the die in order to compensate for thermal expansion during the pressing operation. Since the thermal expansion varies according to wall thickness and other dimensions, it required considerable research to determine the proper dimensions of the die. The pressing process also has an advantageous effect on distortion after heat treatment. It was found that gears which were pressed and then shaved were distorted less by heat treatment than those produced by conventional methods. The grain structure is finer in the pressed gears after heat treatment than in forged gears.

Cost Cutting in Machining Operations

A theoretical analysis of the reduction in cost, by proper observation of the relationship between speed and tool life, is presented in an article by J. Witthoff in Issue No. 1 of *Werkstatt und Betrieb* of 1957, a magazine that celebrated its 90th anniversary this January.

It is not necessarily the highest cutting speed that cuts cost the most but an intermediate speed which depends on the ratio of tool life and cutting speed, among other factors. The author takes the slope of the cutting speed—tool life line into consideration. He also includes time required for changing tools, the tool cost per unit of tool life, hourly wages of the operator, the salvage value of the tool, the cost of regrinding, the number of regrinds and similar quantities.

He refers also to throw-away carbide tips in the United States, indicating that in such calculations only the tool life and number of cutting edges are taken into consideration. He agrees, however, with the finding that clamped-on tool tips permit higher cutting speeds than brazed tips, although the over-all saving is not so substantial in his opinion as might appear.

The author has prepared an extensive formula for the most economical cutting speed, which may not be feasible in small-lot production but important in automation.

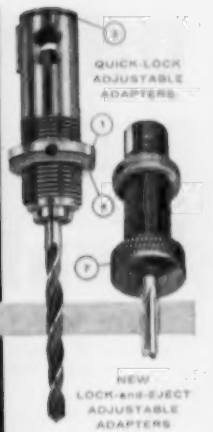
Theory of Grinding Vibration

A mathematical analysis of vibration in internal and external grinding operations was published by J. E. Plainevaux in the French magazine *Révue Générale de Mécanique*, Vol. 40 (94), pages 382-386, November 1956. The author investigated self-excited vibrations, produced by irregularity of the surface before grinding.

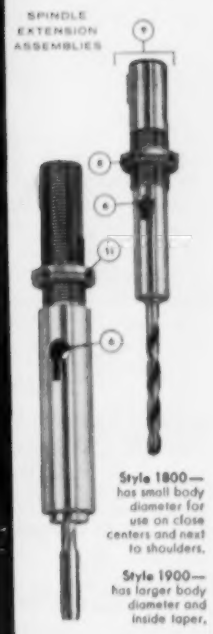
Scully-Jones Adjustable Adapters

FOR PREMIUM PERFORMANCE OF DRILLS, TAPS, REAMERS

AT NO PREMIUM IN PRICE!



These benefits . . .	for these reasons . . .	result from these PREMIUM features
INCREASED ACCURACY	No "cocking" or spindle distortion	1. Top face of quick-lock nut is square with threads.
		2. Locking shoe assures even distribution of pressure on all mating threads.
	Cutting tools run true	3. Bore and shank are concentric within .002 in. gaged 6 in. from adapter.
INCREASED PRODUCTION	Faster adjustment	4. Quick-lock nut locks any place on thread by only ¼ turn of set screw.
	Faster tool changes	5. Pilot nose eliminates "binding."
		6. Keyhole-type drift slot simplifies tool ejection.
		7. New Lock-and-Eject type eliminates use of conventional drift.
LOWER TOOL COSTS	Full use of adjustable range of adapter	8. Quick-lock nut is thinner than nuts used on most adapters.
		9. Small diameter permits use on close centers.
	Reduced tool breakage	10. Keyhole-type drift slot eliminates need for hammering with conventional drift.
	Adapter lasts longer	11. Friction-type nut prevents thread damage. Set screw does not contact threads.
		12. "Stressproof" steel induction hardened to give best combination of wear resistance and toughness.
	Solve pull-out problems	13. New Lock-and-Eject type increase holding power.



Style 1800—has small body diameter for use on close centers and next to shoulders.

Style 1900—has larger body diameter and inside taper.

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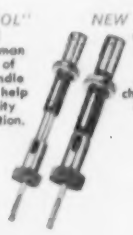
PRECISION HOLDING TOOLS

"Precision Holding" for holding precision

Scully-Jones and Company, 1915 South Rockwell Street, Chicago 8, Illinois

For profit-minded tool buyers!

"TOOLTROL" BOARDS
Take the human element out of multiple-spindle operations, help control quality and production.



NEW TENSION AND COMPRESSION TAP HOLDERS
Lock-and-eject chuck speeds tool changes, increases holding power.

HEAVY-DUTY TAP DRIVERS
Improved snap-ring design increases accuracy and holding power, speeds tool changes.

PRESETTING TOOLS
Reduce setup time, downtime, and inspection time by as much as 50 per cent.

TURRET TOOL HOLDERS
Hardened and precision ground to resist nicking and wear, assure accurate tool alignment.

CLOSE CENTER TAP DRIVERS
New design with four-slot chuck increases resistance to pull-out, keeps taps running true.

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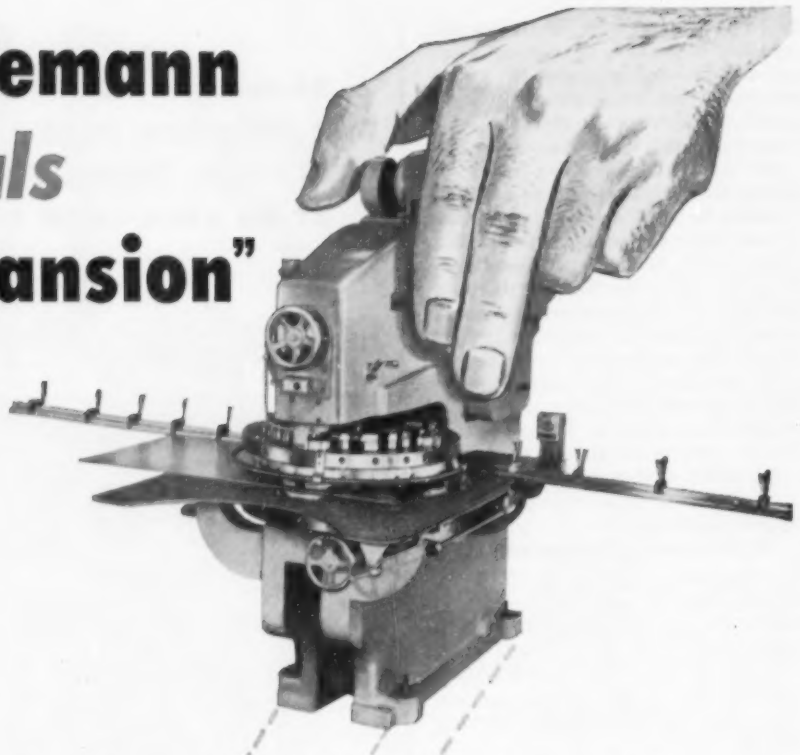
ONE Wiedemann *equals* Plant "Expansion"

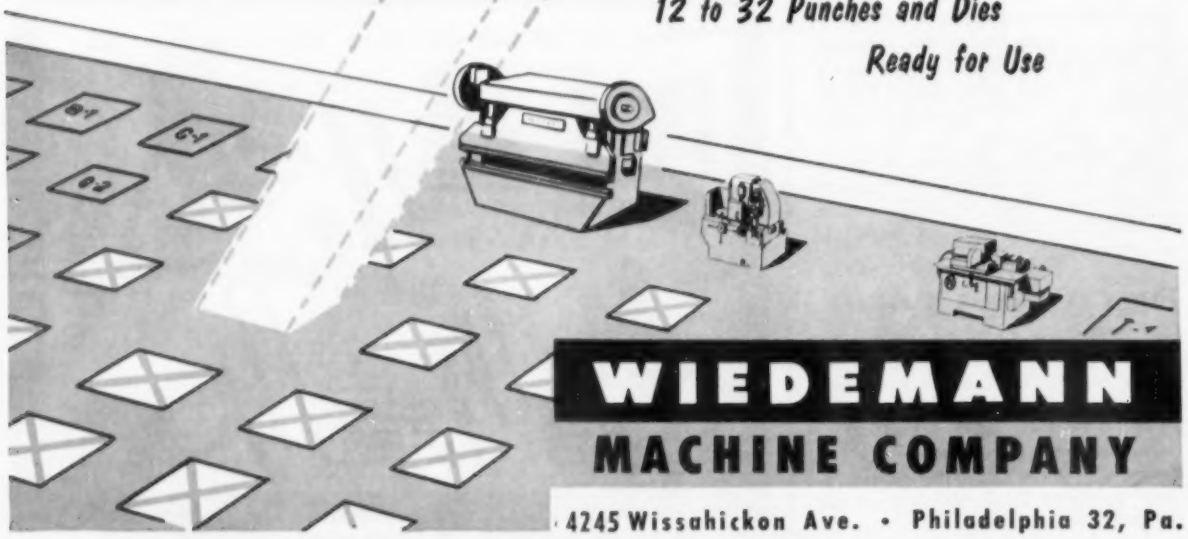


Exaggeration? Not if the experience of Wiedemann users is any criterion.

Wiedemann Turret Punch Presses produce more work in less time and in less space. In numerous plants, one Wiedemann has replaced as many as 12 or 14 units such as single purpose punch presses, layout tables, nibbling machines, etc. And in most cases, the single Wiedemann, in 1/10 the floor space, actually out-produces the multiplicity of conventional equipment. Direct savings of 60% to 90% are commonplace. Machine down-time is practically eliminated; accuracy is improved; valuable floor space is freed; engineering changes become low cost operations. . . .

If you are interested in greater productivity of pierced parts in small to semi-production quantities, such as panels, chassis, truck parts, etc., it will pay you to get the facts about Wiedemann Turret Punch Presses. Send drawings of your work for time study or write for Bulletin 201.

12 to 32 Punches and Dies Ready for Use



WIEDEMANN MACHINE COMPANY

4245 Wissahickon Ave. • Philadelphia 32, Pa.

FIELD notes

Abrasive and abrasive belt machine engineering service, "Maximum Automation Potential," which involves a new concept in abrasive technology, has been developed by The Carborundum Co. Through it, manufacturers are given recommendations by mail for improved metal removal methods with predictions of savings over old methods.

V V V

Comprehensive, gratis service providing assistance on problems involving fuels, lubricants and other products of petroleum, is being set up by Gulf Oil Corp. Goal of this Gulf Petro-engineering Service is to bring engineering and research facilities of the company closer to problems relating to use of different petroleum products.

expansions

American Smelting and Refining Co. is expanding its central nonferrous metal research laboratories at South Plainfield, N. J., by one-third. The new laboratories will be devoted to asbestos application and process research for its subsidiary, Lake Asbestos of Quebec, Ltd. to production and study of high purity metals, and for research on refractory metals such as the rare earths and other high-temperature metals.

V V V

Second major expansion in two years will permit Link-Belt Speeder Corp., subsidiary of Link-Belt Co., to increase its production by 40 percent. The new structure in Cedar Rapids, Iowa provides increased facilities for assembly, machine operations and other work.

V V V

Expanded research and development program has been launched by Associated Spring Corp. to bring about improvement in its present products and development of new products. The program will be under the supervision of Walter E. Froehlich, vice-president. As part of the operation, a new research center is being established at the firm's headquarters which will more than double the company's research facilities and staff, and will effectively supplement facilities of the existing research center at Plymouth, Mich. in the plant of the Barnes-Gibson-Raymond division of the corporation. Dr. Franz P. Zimmerli, who has been in charge of research for the corporation for more than 25 years, will continue to direct all of the company's research and development activities.

V V V

Options on property on the Muskingum River near Coshocton, Ohio have been taken by Universal-Cyclops Steel Corp. to provide land for a long-term program of improvements and expansion which also will involve existing plants at Bridgeville and Titusville, Pa. The company hopes to have new facilities in operation by January 1959. Universal-Cyclops currently is building a $350,000 metallurgical laboratory.

V V V

Expanded sales office and specialty steel warehouse building more than doubles the capacity of the former facilities of Crucible Steel Co. of America in the Philadelphia Area. The building is located at Oak Ave. and the Pennsylvania Railroad in Primos, Pa.

production notes

Substantial expansion of its lines of tools is under way for Heller Tool Co. The program involves lines of hack saw blades, metal cutting band saws and **flat** ground die steel.

V V V

Durant Tool Supply Co. has recently set up to manufacture a line of headed pins for use by tool and die makers and plastic mold manufacturers. The pins are made in a range of sizes from 0.020 through 0.1875 by 0.001 increments.

V V V

In a move to consolidate production facilities, Magnesium Co. of America has started manufacture of Magcon/-Tobey aluminum trucks and other aluminum products at the company's East Chicago, Ind. plant and has discontinued operation of its fabricating facilities at El Segundo, Calif.

V V V

Three aluminum products have been developed by Aluminum Co. of America for use in the porcelain enamel industry. Designated as No. One porcelain enameling sheet and No. One and Two porcelain enameling extruded shapes, the products are of magnesium-silicide type alloys.

V V V

Expanded cylinder stocking program at Miller Fluid Power Div. of Flick-Reedy Corp. will increase the number of standardized cylinder selections offered for immediate delivery from 8,000 different combinations to more than 14,000.

licenses

Arrangements to license manufacture of its vacuum furnaces and related equipment to Wild-Barfield Electric Furnaces, Ltd. in England, have been completed by NRC Equipment Corp. In addition, Wild-Barfield has been named exclusive resale agents in the United Kingdom for all NRC high vacuum components, packaged systems and other price listed items.

new facilities

Plans to establish three regional chemical milling facilities have been announced by United States Chemical Milling Corp. Construction also has already started on an addition to the Manhattan Beach headquarters which will add nearly 50 percent to manufacturing space now in use. First of the regional plants will be in the Dallas-Fort Worth area while the other plants will be located on the East coast and in the midwest. Each plant will provide a complete subcontracting service with production control, inspection, process control, tooling and contract administration departments as well as production departments for chemical milling aluminum and magnesium.

V V V

American Coldset Corp. has opened new plant and offices in Teterboro, N.J. which provides facilities for research and development in industrial diamond applications as well as expanded production.

V V V

To permit expanded research into properties, applications and improvement of high alumina ceramics, Diamonite Products Mfg. Co. has opened extensive research laboratory, product

development and pilot production facilities. The operations are in connection with the company's recently occupied manufacturing plant in Canton, Ohio. Facilities, housed in a separate plant, include complete ceramic, chemical, mechanical, petrographic and high temperature laboratories and a fully equipped machine shop. In a separate bay, a pilot plant is equipped for small scale production.

v v v

Construction is starting on a $250,000 western research center at Anaheim, Calif. for Robertshaw-Fulton Controls Co. When it is completed, the company's present research facility near the Los Angeles International airport will be merged with the new center.

An auxiliary plant has been opened in Cleveland, Ohio for Lester-Phoenix, Inc. The building has been designed especially for the machining operations devoted to the company's injection molding and die casting machines.

v v v

Two district offices have been established by Norton Co. in Atlanta, Ga., and Indianapolis, Ind. with Norman R. Ekholm and John R. H. Truelsen as the respective district managers.

v v v

Arrangements to purchase a 170,000 sq ft building at 10101 Woodland Ave. in Cleveland have been announced by Clark Controller Co. The firm is expected to occupy the building by late 1957, after operations now being conducted there by Western Electric and Ohio Bell Telephone Co. have been transferred.

v v v

New, modern plant for Automatic Switch Co. is located on 30 acres of land off Hanover Rd. in Florham Park, N. J.

purchase

Chromalloy Corp. has acquired the Elyria Foundry from the Industrial Brownhoist Corp. for approximately $2-million cash. The foundry will continue as a division of Chromalloy and will continue to be headed by Howard C. Gollman who was elected a director of Chromalloy and executive vice-president in charge of the Elyria Foundry Div.

v v v

Manufacturing and sales rights for a line of portable precision machining units known as Versa-Mil have been purchased by Dumore Co.

v v v

Outright purchase of the Danville, Ill. plant of the F. L. Jacobs Co. has been announced by Detroit Harvester Co. The acquisition was part of Detroit Harvester's current program of diversification and expansion.

moves

General offices of A. Milne & Co. have been moved to 67 W. 44th St., New York City. The company's warehousing operations serving the New York metropolitan area will continue from the present Washington St. location until they are transferred to a new warehouse now being constructed in Kenilworth, N. J. Completion is expected by early spring of this year.

v v v

Sales headquarters of the Spring Div. of Crucible Steel Co. of America have been moved to Pittsburgh from New York City in order to provide increased coordination of activities of the division and improved customer service.

v v v

Turchan Follower Machine Co. has moved into its new building at 26950 Van Born Rd., Inkster, Mich. The new plant provides 20,000 sq ft of floor space to accommodate increased engineering, experimental and manufacturing facilities.

v v v

Arrow Tool and Reamer Co. has moved into its new building at 711 Stephenson Hwy., Troy, Mich. The plant provides the latest facilities for

For...

General-Purpose Sawing

with

High Speed

Accuracy, Economy

Model 4B/M2/E2
Equipped with standard work track
(Optional Equipment).

Let us prove to you the many reasons why this MARVEL Hack Saw offers the cheapest, most accurate and fastest "cut-off" method available to you at a low initial cost.

Ask your dealer, or write us for Bulletin GP35 which fully describes and illustrates the many exclusive features which makes this Hack Saw Machine your "best buy".

MARVEL No. 4B

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Exclusive features

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2. Screw Feed—Automatic or Hand Driven.
3. Quick Return Stroke—allows greater number of strokes per minute.
4. Simple Positive Coolant System.
5. Adjustable Stroke—can be shortened for larger capacity.
6. Speed Range—available in 1, 2 or 4 speed models for wider range of work.

MARVEL Metal Cutting SAWS
Better Machines-Better Blades

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design and manufacture. The company's Fascut line will continue to be manufactured at the Charlotte, Mich. plant.

v v v

Branson Instruments, Inc., and its subsidiary, Branson Ultrasonic Corp., have moved into a new plant at 37 Brown House Rd., Stamford, Conn. This change provides more than twice the working space available in the previous facility.

v v v

Henrich Tools, Inc. has moved into its new plant at 2707 Industrial Dr., Racine, Wis. which provides room for additional equipment and more modern facilities.

name change

Pendleton Tool Industries, Inc. is the new corporate name of the firm formerly known as Plomb Tool Co. The parent company plant located in Los Angeles and a division located in Jamestown, N. Y. will operate under the name Proto Tool Co. as divisions of Pendleton Tool Industries, Inc. Other subsidiaries of the parent company will continue to operate under their own corporate names.

new companies

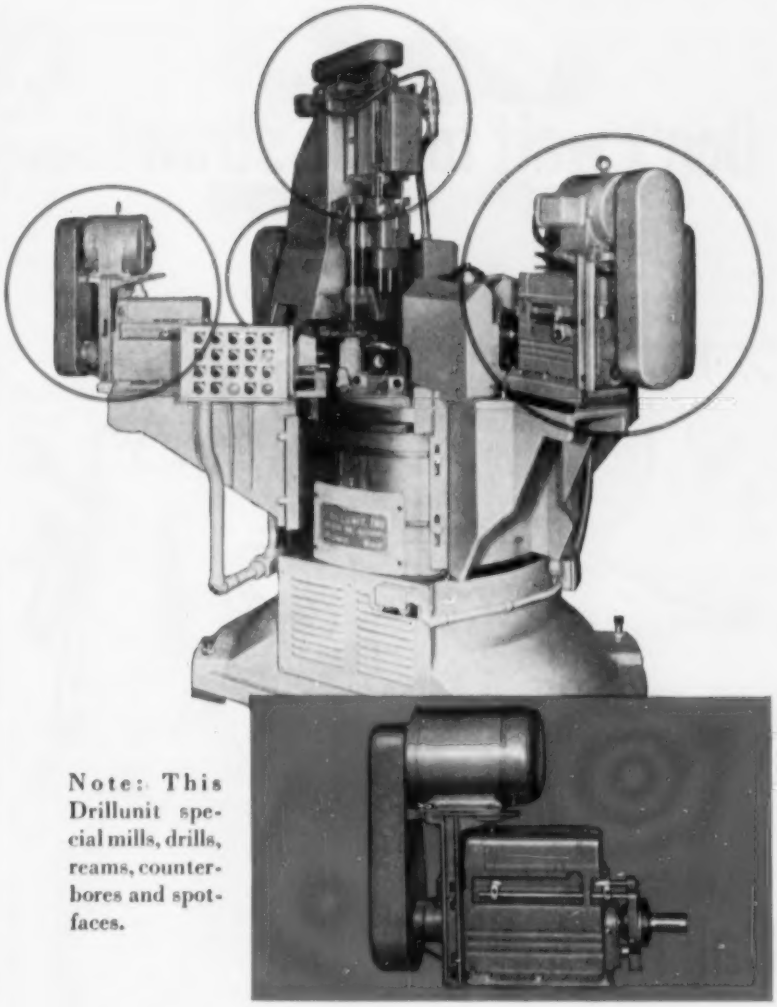
Allied-Kennecott Titanium Corp. has been formed by Allied Chemical & Dye Corp. and Kennecott Copper Corp. to produce and sell titanium metal. According to the production schedule set by Allied and Kennecott, operations are expected to begin late in 1958. Until a titanium producing plant is put into operation, the company's interim office will be located in Solvay, N. Y. with Raymond Largent, vice-president and project manager, in charge.

v v v

Formation of its Nilos Ring Div. to distribute Nilos rings made by Ziller and Co. of Dusseldorf, Germany has been announced by The Dumore Co. The patented rings provide a metallic means of protecting bearings from foreign material and retaining lubricants.

new activities

Establishment of a metallurgical product development group to handle metallurgical problems associated with complexity of product development more effectively has been announced by Vanadium-Alloys Steel Co. The new group will be managed by metallurgical engineer H. G. Johnstin, who is a member of ASTE's Pittsburgh chapter. Don-



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ald F. Griffin will serve as assistant manager.

v v v

Firth Sterling Inc. and Oregon Metallurgical Corp. have completed a joint venture agreement for production and processing of titanium bars and forged rounds. Under the new arrangement, Firth Sterling will process titanium ingots produced by Oregon Metallurgical into mill products.

v v v

Datascan, Inc. a corporation engaged in manufacture of components and equipment for the industrial control and data handling field, has started a manufacturing operation in Little Falls, N.J. at 48 Notch Rd. The firm is set up to design, develop and construct data monitoring and processing systems, industrial control systems and automatic high-speed testing-sorting systems.

warehouses

A specialty steel warehouse and sales office has been opened by Crucible Steel Co. of America at 6033 E. Bandini Blvd. in Los Angeles, Calif.

v v v

Firth Sterling Inc. has opened a new warehouse at 2900 S. Vail Ave. in Los Angeles. Utilizing 12,000 sq ft of building space, the facility will provide stock for distributors in 11 western states, Hawaii and the Philippine Islands.

v v v

Establishment of a West Coast branch for warehousing and service of the company's lines has been announced by Huck Mfg. Co. The new facility is located in Englewood, Calif.

sales

Appointment of Stephen Smith to manager of sales service department has been made public by Norton Co. He has been supervisor of Norton's sales department.

v v v

Firth-Loach Metals, Inc., has revealed appointment of E. J. Reitler as sales manager of the company. Formerly he held the position of assistant sales manager.

v v v

Dan R. Scott is now sales manager for the Allied Products Div. of Motch & Merryweather Machinery Co. He previously was district sales manager for the company's Cutting Tool Div.

v v v

According to recent announcement, Jack Merritt is now direct sales representative of the Hy-Pro Tool Co. in the state of Michigan.

who's meeting and where

Apr. 30-May 2. Investment Casting Institute. Annual spring meeting, Sheraton Park Hotel, Washington, D.C. Obtain further details from institute office, 27 E. Monroe St., Chicago 3, Ill.

May 1-3. Electronic Components Symposium, co-sponsored by American Institute of Electrical Engineers, Institute of Radio Engineers, Radio-Electronics-Television Manufacturers Assn., West Coast Electronic Manufacturers Assn., Morrison Hotel, Chicago, Ill. More information may be obtained from J. S. Powers, Electronics Components, Symposium, 84 E. Randolph St., Chicago 1, Ill.

May 5-7. National Tool & Die Manufacturers Association. Spring meeting. Mayflower Hotel, Washington, D. C. Direct inquiries to association headquarters, 907 Public Square Bldg., Cleveland, Ohio.

May 6-10. American Foundrymen's Society. First Engineered Castings Show, combined with 61st AFS Castings Congress, Music Hall, Cincinnati, Ohio. Request details from society's office, Golf and Wolf Rds., Des Plaines, Ill.

May 9-10. Illinois Institute of Technology. Conference on Managerial Controls, IIT campus, Chicago. Get details from Conference Coordinator, Illinois Institute of Technology, 3300 S. Federal St., Chicago 16, Ill.

May 13-16. National Welding Supply Association. Annual meeting, Mayflower Hotel, Washington, D. C. Contact association secretary, R. C. Fernley, 1900 Arch St., Philadelphia 3, Pa., for more information.

May 14-16. Armour Research Foundation and Nucleonics Magazine. Industrial nuclear technology conference, Museum of Science and Industry, Chicago. For complete data, write Conference Secretary, Armour Research Foundation, 10 W. 35th St., Chicago, Ill.

May 16-17. American Institute of Industrial Engineers. Eighth annual conference, to be followed by one-day convention on May 18, Hotel Statler, New York, N. Y. Get further data from Harvey H. Brock, Director of Programs, 565 West End Ave., New York 24, N. Y.

May 20-21. The Society of American Military Engineers. Annual meeting, Washington, D. C. Other data is available from society office, 808 Mills Bldg., Washington, D. C.

May 20-23. Design Engineering Show, New York Coliseum, New York, N. Y. Send for more information from exposition managers, Clapp & Poliak, Inc., 341 Madison Ave., New York 17, N. Y.

May 22-24. American Society for Quality Control. 11th annual convention, Masonic Temple, Detroit, Mich. For more information, contact R. V. Ward, Canadian Industries Ltd., P. O. Box 10, Montreal, Quebec, Canada.

May 26-31. Special Libraries Association. Annual convention, Hotel Statler, Boston, Mass. Metal Div.'s symposium, The Technical Writer and the Special Librarian, will be on May 27. Get details from Katherine Janis, International Nickel Co., Inc., 67 Wall St., New York 5, N. Y.

June 5-7. Bureau of Apprenticeship and Training, U. S. Department of Labor. Eastern Seaboard Apprenticeship conference, Marshall House, York Harbor, Me. Cooperating states include Maine, Vermont, New Hampshire, Con-

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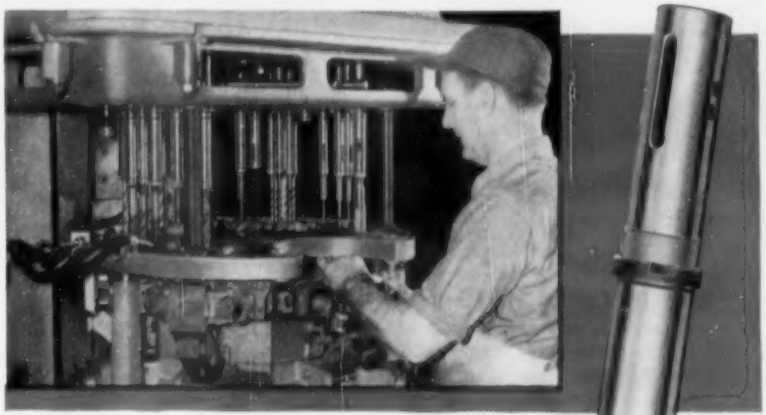

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necticut, Massachusetts and New York. Write to Maine Apprenticeship Council, Dept. of Labor and Industry, Augusta, Me., for more data.

June 5-14. WASHINGTON UNIVERSITY. Motion and time study intensive course will cover setting up correct methods as well as techniques for improvement of existing methods and procedures in order to prepare those attending the course to apply motion and time study to their own organizations and to train others in principles of motion and time study. For further information write University College, Washington University, St. Louis 5, Mo.

June 9-14. THE PENNSYLVANIA STATE UNIVERSITY. Third annual engineering seminar on automation for industry, University Park, Pa. For further information, contact Chester Linsky, assistant professor of industrial engineering, The Pennsylvania State University, University Park, Pa.

June 11-13. WESTERN PLANT MAINTENANCE AND ENGINEERING SHOW, Civic Auditorium, San Francisco, Calif. Request details from exposition managers, Clapp and Poliak, Inc., 759 Monadnock Bldg., San Francisco 5, Calif.

June 12-14. ILLINOIS INSTITUTE OF TECHNOLOGY. Operations Research conference, IIT campus, Chicago, Ill. Forward inquiries to Conference Coordinator Raymond D. Meade, Illinois Institute of Technology, 3300 S. Federal St., Chicago 16, Ill.

June 14. PRESSED METAL INSTITUTE. National sales conference for metal stampers, Hotel Carter, Cleveland, Ohio. More data is available from institute office, 3673 Lee Rd., Cleveland 20, Ohio.

June 14. SOCIETY OF PLASTICS ENGINEERS, INC. Regional technical conference on "Plastics for Electronics," Lowell Institute of Technology, Lowell, Mass. Direct inquiries to Ralph Mondano, Raytheon Mfg. Co., Foundry Ave., Waltham, Mass.

June 16-21. THE PENNSYLVANIA STATE UNIVERSITY. Fourth annual seminar in creative engineering. Further information may be obtained from seminar chairman, Maurice Gjesdahl, professor of mechanical engineering, The Pennsylvania State University, University Park, Pa.

June 16-21. AMERICAN SOCIETY FOR TESTING MATERIALS. 60th annual meeting, Chalfonte-Haddon Hall, Atlantic City, N. J. Request details from society headquarters, 1916 Race St., Philadelphia 3, Pa.

technical Shorts

VACUUM PROCESS for production of highly reflective metallic coatings on rolls of plastic film and textile fabrics was perfected by National Research Corp. As a result, production of practically flawless metallized surface on du Pont Mylar polyester film for metallic yarn, automobile interior trim, luggage and multiple other applications was made possible. Earlier continuous metallizing processes were difficult to control, often left streaks, pinholes and other surface imperfections, and could be run only for a few minutes at a time.

Metalizing Method Minimizes Coating Flaws

In the NRC process, a roll of material to be metallized is placed in a vacuum-tight tank which is closed and pumped until pressure has been reduced to about one millionth of atmospheric. The roll is then unwound past a source of molten metal, usually aluminum, heated to a temperature of more than 1200 C. Aluminum vapor from the source condenses on the surface of the film as it passes, producing a very thin, bright surface.

After the entire roll has passed the metal source, it is rewound inside the tank, the chamber is opened, the roll removed, and a new roll installed.

The new process is being commercialized through NRC Vaculite Corp., a wholly owned subsidiary.

* * *

TECHNIQUES developed during its past century of precision polishing are being utilized by Bausch & Lomb Optical Co. to produce surfaces on stainless steel hemispheres that are accurate to between 4 to 6 microinches. This project is considered an advance on further refinements in a process which will lead to an order of hyperaccuracy in surfacing of metals. Need for such a finishing process has grown out of requirements of supersonic aircraft and missile research programs.

Process Offers Hyperaccurate Metal Surfaces

According to Bausch & Lomb officials, their researchers already have developed techniques that permit superfinishing hard metals of spherical, parabolic and elliptical shapes up to 36 in. in diameter. Experimentation on larger surfaces of other shapes is presently underway.

Spur to interest in this field was a request by the research and advanced development division of Avco Mfg. Co. whose engineers needed test samples for determining air flow patterns of high velocity winds against different metal surfaces. Avco sent six 19-in. hemispheres of rough spun 400 series steel. Different surface specifications, ranging from 4 to 6 microinches to 180 microinches were established for each hemisphere. Utilizing methods developed for grinding and polishing of reflectors for Army and Navy searchlights and motion picture projectors, Bausch & Lomb engineers were able to meet both the Avco surface specifications and the 30-day production deadline that had been set. It was following this success that a program for further study of the problem of metal superfinishing was inaugurated.

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Holes, Contours, Surfaces

Published in the interests of greater accuracy and quality in the toolroom and on the production line by the Moore Special Tool Co., Inc., 732 Union Ave., Bridgeport 7, Conn., builders of Jig Borers, Jig Grinders, Panto-Crush Wheel Dressers, Precision Rotary Tables, Motorized Centers and a complete line of Hole Location Accessories.

New 424-page Book Tells How You Can Produce Tools, Dies, Precision Parts the Modern Way

"Holes, Contours and Surfaces" Just Published

"Holes, Contours and Surfaces," just published by Moore, gives all the answers to metalworking's toughest problem: *the accurate locating and machining of holes, contours and surfaces.* It covers the many major developments in the field since 1946 when Moore's first book, "Precision Hole Location," was published. That book became a technical best-seller and is now out of print.

While "PHL" dealt only with jig boring and jig grinding of holes, this new, 424-page volume describes subsequent hole-location developments, covers contours and surfaces, and introduces the subject of linear form grinding. "HC&S" is a must for every toolmaker, jig borer operator, jig grinder operator, machinist, tool engineer, production engineer, machine buyer, machine builder, production executive, product designer, apprentice and student.

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495 Photos and Drawings

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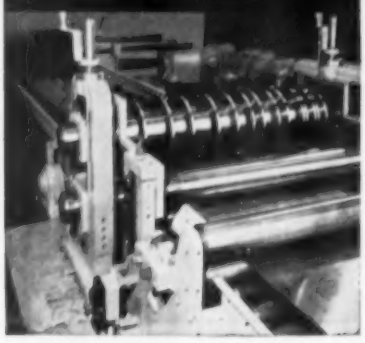

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These typical examples demonstrate, first, the big potential output of a relatively small, inexpensive Yoder standardized Slitting Line and, secondly, its big profitability. Assume production of only 35 tons of slit strands per 8 hour shift, one day per week, and the total per year would be 1750 tons. Estimating the saving in slitting cost at only one-half cent per lb., the total annual saving would be $17,500.00.

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good READING

ENGINEERING AS A CAREER—*by Ralph J. Smith. Published by McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York 36, N. Y. Price $4.75. 365 pages.*

Written to acquaint beginning students with engineering as a career, this combination text and problem book was designed primarily for use in engineering orientation courses. Besides indicating the qualifications, duties, and responsibilities of engineers, it defines the engineering profession in terms of functions as well as branches.

In addition, the book provides motivation for the study of pre-engineering courses; provides training in the philosophy and technique of problem solution; and previews the basic engineering sciences and demonstrates their application.

QUALITY CONTROL FOR PLASTICS ENGINEERS—*edited by Lawrence M. Debing. Published by Reinhold Publishing Corp., New York, N. Y., 142 pages.*

Sponsored by the Society of Plastics Engineers, this book is the first in a series of technical volumes on plastics. It covers statistical quality control as applied to plastics manufacture and includes chapters on the use of frequency distributions; control charts for variables and attributes; specifications; sampling inspection; statistical correlation; process capability analysis; significance; and statistical experiments in plastics fabrication. Numerous examples of current applications of statistical quality control in the plastics industry are cited.

ENGINEERING IN HISTORY—*by Richard Shelton Kirby, Sidney Withington, Arthur Burr Darling, Frederick Gridley Kilgour. Published by McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York 36, N. Y. Price $8.50. 530 pages.*

This history of engineering is intended to present the development of engineering in Western civilization from its origin into this century. Emphasis is placed upon the history of civil, electrical, and some aspects of metallurgical (iron and steel) and me-

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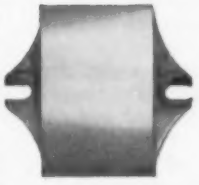

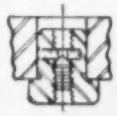

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chanical (power and transportation) engineering. Special branches, such as military, naval and chemical engineering are not included.

The feature of *Engineering in History* is its historical discussion of the interaction of engineering with society. Most histories are written as though science and engineering were not affected by other human activities and had no effect on society. The authors show how various factors in the physical and cultural environment conditioned engineering advance and how, in turn engineering has had its impact on the rest of society.

NATIONAL STANDARDS IN A MODERN ECONOMY—*edited by Dickson Reck. Published by Harper & Brothers, New York, N. Y. Price $5.00. 372 pages.*

This book is both a review of the evolution of standards and an evaluation of their place in the world today. Thirty-four contributors, including former President Herbert Hoover ("The Crusade for Standards"), Dr. A. V. Astin ("Significance of the National Bureau of Standards for Industrial Progress") and Walter P. Reuther ("Labor Uses Standards"), discuss all aspects of standardization.

Tool engineers will be especially interested in the chapters on standards and automation, company and national standards in interchangeable parts manufacture, and quality control standards. Other sections of the book will be equally interesting to engineers who are assigned specifically to standards work.

MACHINE TOOLS FOR METAL CUTTING—*by W. H. Armstrong. Published by McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York 36, N. Y. Price $5. 358 pages.*

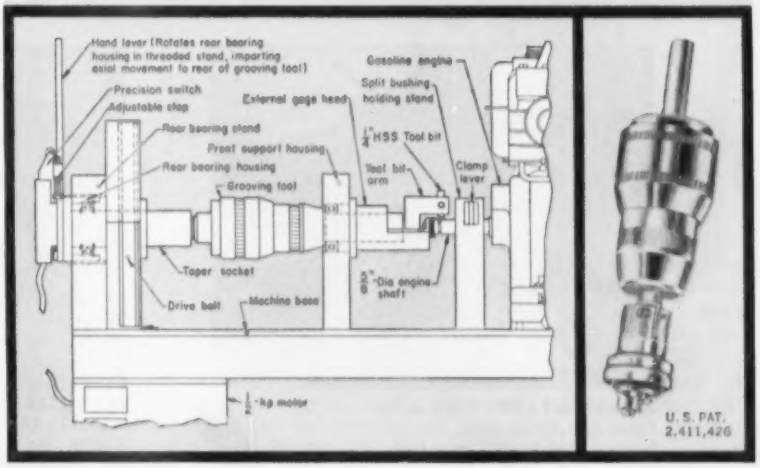
Written primarily as a textbook, this book will provide students and practicing engineers with the technical information about materials, tools and processes to aid them in machine design, time study, production planning and control and similar areas connected with manufacturing machine-shop products.

The machine tools are listed and described and the work they are used for is explained. This book deals with machine-shop problems and processes only and does not deal with other areas of manufacturing.

Also, the author shows the relationship of the machine shop to the metalworking industry; he classifies machine tools and lists the essential parts of a machine tool.

Definition and other materials from *American Standard Preferred Limits and Fits for Cylindrical Parts* are presented and explained.

Groove cut in shaft of fully assembled engine with WALDES TRUARC GROOVING TOOL



To install a small gear, Clemson Bros. must machine a recess (Tolerance: +.033" —.000") in a shaft of the engine for their power lawn mowers.

Engines arrive fully assembled. Normal procedure was to rotate the shaft. That involved removing a spark plug, mounting each engine firmly and accurately on a lathe, securing a gear or sprocket on the shaft, driving the shaft and moving the stationary cutting tool into position. The engine had to be reassembled after grooving.

All this costly time and labor was eliminated by holding the shaft stationary and *using a tool that rotates*—the Waldes Truarc Grooving Tool, equipped with an external grooving attachment. Because grooving dimensions are pre-set on the tool, there are no rejects caused by inaccurate cutting.

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Thousands of companies are making drastic savings by using standard Vlier Tooling Specialties instead of costly custom-made substitutes. The applications shown below are only the *obvious* uses for these simple, inexpensive tooling specialties.

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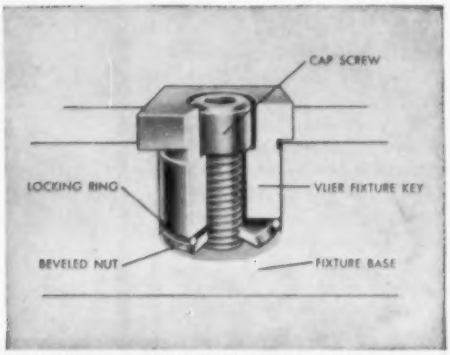
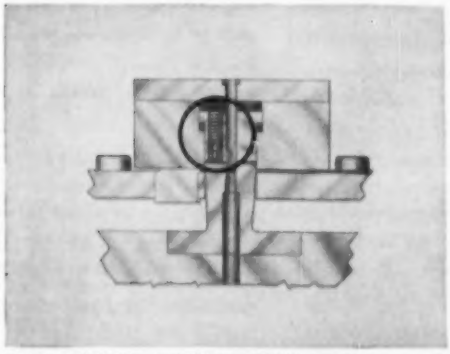


NEW FIXTURE KEY WITH INSTANT-ACTING, INTEGRAL LOCK eliminates unnecessary drilling and tapping operations to mount keys in fixture base. Holds key securely, permits quick change of key size for different table slots. Insures perfect alignment of jigs and fixtures on table.



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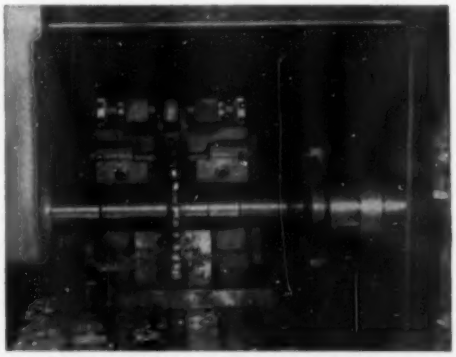

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research staff
and
S. Menton
manager
manufacturing staff
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General Motors Corp.
detroit, mich.

Tech Digests

BECAUSE OF THE LIMITED productive life of low-cost tools, a development program was undertaken to furnish an improved die material to bridge the gap between zinc-base tools and ferrous dies. The material which resulted will substantially outwear conventional zinc-base tools, yet costs little more.

This material contains nickel and titanium alloyed with zinc in such a way that they form hard intermetallics in the softer matrix. Wear resistance is attributed to this dispersion of hard particles, their action in reducing attricious wear being likened to that of a carbide network in steel. The nominal composition of this material, which is known as Gmoodie, is as follows:

Aluminum	4.00%
Copper	3.25
Magnesium	.15
Nickel	.80
Titanium	.20
Zinc	Balance

Tools and dies of zinc-base alloys require little labor or machining time for finishing since they are usually cast with simply constructed and maintained foundry equipment. Usually, the only machining required is squaring up sides to remove pattern draft and provide flat and parallel bearing surfaces. Faces of cast dies may be finished with abrasive disks, cup wheels and files.

Since worn or obsolete tools can be remelted and recast with a loss of only 5 percent or less, salvage value of dies is high. General Motors Overseas Operations has cast more than 1,000,000 lb of this material into tools. All dies were conventional type used on conventional press equipment, *Fig.* 1.

This new zinc die alloy, when used in drawing, forming, flanging, and bending dies, is capable of producing from 5,000 to 200,000 steel stampings, depending on the nature of the work. Stampings which have been formed include cold-rolled steel from 24 to 9 gage, stainless in light gages, aluminum from 0.022 to 0.060 in.

Performance

Experimental runs on steel up to ¼ in. thick have been made satisfactorily. Stampings from steel stock nearly ⅜ in. thick were also produced successfully in quantities to 400. Most production experience, however, and data on which performance is based are on 18 to 20 gage sheet steel. With light gage stock of this type and on moderate draws, the nickel titanium zinc alloy will usually outwear conventional zinc-base tools 4 to 1. As the gage size increases or severity of the operation increases, difference between the two zinc-base alloys will decrease somewhat.

In one instance, the program involved fabrication of household refrigerator panels from 18 to 22 gage drawing quality steel and enameling iron. Most panels were basically simple geometry with flat sides and bottoms, *Fig.* 2. Anticipated life of the tooling was 50,000 pieces. This was exceeded on most of the tools used in the program. On some, as many as 120,000 stampings were realized and the dies were still usable.

A second program required fabrication of complex, compound-curved surfaces for a truck cab. Although the same gage was used as for the refrigerator panels, life expectancy was 25,000 parts per die. These tools have produced approximately 15,000 pieces to date, but they give every indication of attaining the goal. Where heavier sheet gage has been used in the truck cab, the expected goal of 25,000 parts will be obtained only by fitting steel inserts in the die at points of maximum load. Past experience indicates, however, that only about 3,500 stampings per die could have been obtained in these applications with conventional zinc-base tooling.

Costs

While the present cost of the nickel-titanium zinc alloy is 1.5 to 2 times that of conventional zinc die alloy, the material is little more expensive since it can be written off over a larger number of parts.

Comparisons of the cost of a set of tools are shown in TABLE 1. The data

Fig. 1. Typical forming operation using new zinc-base, wear resistant alloy die for a large, sheet metal part.

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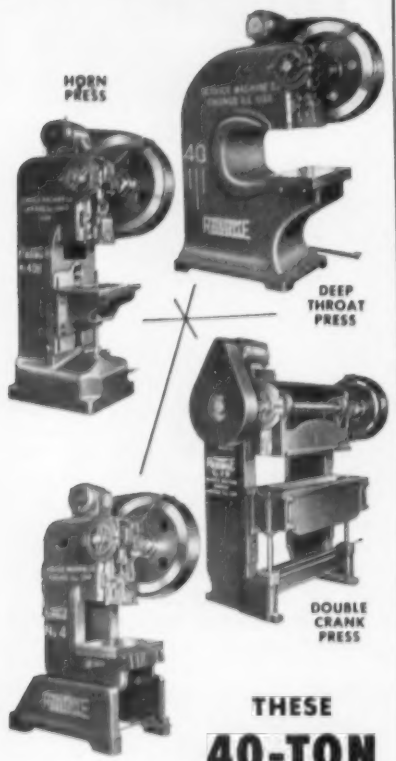

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Table 1—Cost and Service Life of a Die for Refrigerator Panels

Cost Analysis	Conventional Zinc-Base Alloy	Nickel-Titanium Zinc-Alloy	Conventional Iron Die
Design, patterns and founding	$ 597.20	$ 597.20	$1560.00
Labor and overhead for machining, fitting and tryout	1115.90	1115.90	4400.00
Die material	690.00	1230.00	640.00
Total Cost	$2403.10	$2943.10	$6600.00
Credit for material recovered	621.00	1107.00	90.00
Net Cost	$1782.10	$1836.10	$6510.00
Estimated stampings per die	8,000	30,000	200,000
With steel inserts	12,000	42,5000	

were obtained by sending out die design drawings for competitive bids and comparing quotations.

Studies such as this have shown that zinc-base tools can be made at a cost of from 25 to 70 percent that of ferrous tooling. Further, lead time needed to get the die in operation is usually much shorter for the zinc tool. In some instances, it has been able to put a medium-size die in operation with only 5 man-hours handwork from the time the castings were removed from the mold to the point where it was producing parts, *Fig.* 3. This, of course, necessitates precise patterns and careful attention to molding techniques.

Design Limitations

While the new material is particularly suitable for a moderate volume of parts, it shows no advantage over conventional zinc tooling for low volumes of a few hundred parts. In fact, the difference in material costs favors use of the conventional zinc alloy.

In designing dies of the new material, sharp edges and small radii should be avoided, particularly on draw die rings. Since it is about equal in hardness and yield strength to cold-worked sheet steel, plastic flow of the die alloy will result where unit loading of the die surfaces is particularly high such as at corners or locations where sheet metal tends to gather or wrinkle.

Steel inserts or reworking of worn areas by puddling with a torch and refinishing are possible solutions.

Sheet steel for production on this new alloy as with other zinc tools requires more careful preparation than for hard dies. A lubricant such as flake graphite will prolong the life of the dies, particularly if used during the break-in period of the first hundred

Fig. 3. Handworking zinc base die in the press to prepare it for production.

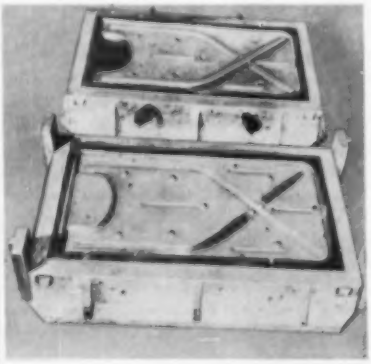

Fig. 2. Refrigerator panel die which produced approximately 68,000 pieces and cost about $64.52.

blanks. The choice between the new alloy, iron or conventional zinc depends on the anticipated production. Iron dies are economical for volumes in excess of 30,000 to 60,000 parts if the forming operation is severe, while the new alloy might be the choice for light working up to 100,000 or more pieces. Since it is possible to produce several zinc-base dies at less cost than a hard die, the choice in the middle area of production must be based on extra maintenance required for multiple zinc tools and other considerations.

From a paper "Wear Resistant, Low-Cost Sheet Metal Forming Dies" given at the SAE National Production Meeting and Forum, March 1957. Society of Automotive Engineers, Inc., 485 Lexington Ave., New York 17, N. Y.

Engineers in the Atomic Age

By Willard F. Libby

Commissioner
U. S. Atomic Energy Commission
Washington, D. C.

Science and engineering of the atomic age derives from the increased importance of nuclear phenomena. Nuclear fission changed technological trends abruptly and overnight the new engineering was conceived.

Engineers and scientists must be educated for this new work in order that the development of the atomic uses, peaceful and military, may proceed. This must be a twofold program—both for graduate engineers and scientists, as well as for new undergraduates and graduate students. Practicing graduate engineers and scientists must be taught the new points and must train the new undergraduate students in the new discipline. It is a large and difficult task, but progress is being made. The problem is that there are fewer engineers and scientists than the overwhelming demand requires.

The steps necessary to solve this problem are not clear, but various facts appear to be important. High school

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teachers are relatively poorly paid, so it is difficult to offer the scientific subjects for which the teachers can command much higher pay outside. At present, big city high school and college teachers receive real pay about equal to 1904, while the real wages of labor, in general, have doubled or trebled. There is little monetary incentive for people to become teachers.

Engineers and scientists are not as well paid as they might be. This is being corrected rapidly, however, by the law of supply and demand.

The technical life is a hard one—scientists and engineers must be interested and devoted to be competent—the desire to make money will never suffice alone.

The technical life seems to be less attractive in this sense than law or business. Why? It may be that it is due to poor general explanation and description of the technical life.

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sense, are derived from the efforts of technical people. Longer life, more survivals at birth and the rising standard of living are directly attributable to technical advances. Therefore, the engineer-scientist's life is a useful one.

The life, being useful, is also exciting. Nothing in human experience equals the discovery of a fact never before known to man.

The thrill of discovery of permanent additions to human knowledge should be imparted to high school teachers and students, so this great fact can play its proper role in early decisions by the student.

Many additional facts have not been adequately explained to the high school student, such as the fact that technical salaries are comfortable, though less than they might be; that many interesting people are known by all technical people, there is a certain fellowship which binds them together just as in the arts; that even for nontechnical people a scientific education may well be worth-while, when so much of our modern economy is coming to depend directly and in short-term on research.

The Atomic Energy Commission has taken certain steps to alleviate the situation. These new and expanded programs are designed for the immediate future, to expand specialized training in nuclear energy technology for industrial and government employees and a quota of foreign nationals; for the longer range, to assist colleges and universities in establishing curricula and acquiring scientific equipment for use in nuclear science and engineering instruction; and to interest high school students and teachers in nuclear subjects.

In addition, the Commission is conducting a series of surveys in an attempt to pinpoint needs in the U. S. as well as in connection with international commitments, over the next 20 years for individuals trained in nuclear science and engineering; determine whether or not the planned facilities of Commission installations, industry, colleges and universities, will meet the needs.

The problem of scientific manpower and education is serious to all of our people and one which requires solution in the national interest. The problem is not insoluble and if everyone does his bit, it will be solved.

From a talk given before the American Society for Engineering Education, University of Illinois, Urbana, Ill., given before the Washington section.

▼ ▼ ▼

Ultrafinishing—A New High-Precision Lapping Process

By T. G. Lewis, Jr.
Research Engineer
Mechanical Development Lab
E. I. du Pont de Nemours & Co.
Wilmington, Del.

A number of important innovations have been made which permit use of lapping for production of exceptionally smooth metal surfaces with precise geometrical control. This body of patented techniques, called ultrafinishing, includes the necessary variations in velocity to permit lapping of soft homogeneous and hard heterogeneous metals.

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Ultrafinishing is basically a modified lapping process. The five components of lapping, *Fig.* 1, are lap, work, abrasive, vehicle and pattern.

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From the standpoint of economics, the low velocity technique can be practiced at about half the cost of other commercial techniques. Furthermore, it provides better geometry control.

The high-velocity process does not

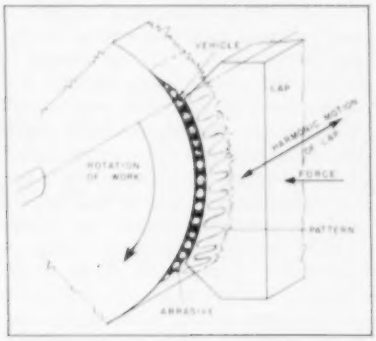

Fig. 1. Components of lapping process.

offer the same economic advantages. On the other hand, conventional processes do not yield a surface of equal quality. Therefore, for the manufacture of certain high-quality, sheet-like materials, there is no substitute for ultrafinishing.

From paper No. 56-A77, presented at the 1956 Annual Meeting of the American Society of Mechanical Engineers, 29 W. 39th St., New York, N. Y.

▼ ▼ ▼

Preparing for Tape-Controlled Production

(Panel Discussion)

Although much has been heard about numerical or computer control of machine tools for some time, it is still a very specialized art and actual applications are limited. They will increase rapidly in the next few years, however. Many shops will need to become acquainted with the possibilities of this method of processing parts because of the air force program in this field.

Virtually every machine tool builder is now collaborating with an electronics supplier to work out a control system.

To get into this field the manufacturer must first decide what he wants to do. There are several considerations before numerical or tape control can be applied. Some of these are the geometry of the part, the development of numerical data on the part before manufacturing, they need to know the number of axes that will be used in positioning the part, desired accuracy, permissible cost and elapsed time permissible.

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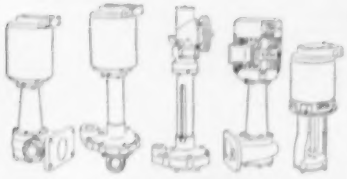

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dom are reduced to numerical systems or expressions, in contrast to the aircraft industry. Therefore, first applications may be expected in aircraft. Another reason for early application in aircraft is that quantities may be limited, extreme precision may be required and the parts must be produced to that precision regardless of cost because of the necessities of military needs.

The great advantage of tape control of machining operations is that repetitive accuracies can be secured higher than those by human operators. Also the setup can be changed rapidly. So early applications may be on job-lot type of production where it would be particularly economical. While much present equipment can be converted any machine would have to be completely rebuilt.

Programming of Parts

The question many potential users will have is what parts are most suitable for programming. Parts such as cams, which may require considerable calculation, would be more economically programmed for computer-controlled production. In some instances the numerical system may make possible production of parts which were considered impossible previously.

A possible procedure for programming a part would consist of a methods conference of the tooling people, process engineers and programmer. They would make a mathematical analysis from the part drawing and tooling information considering the type of part, material used and machining needs. Then it would be necessary to determine how the cutter would move in the air to make the part. Information would be developed to place on numerical coordinates the dimensions from a given reference point.

The actual tape is produced by clerical methods by identifying X and Y coordinates of each break point. After the tape is prepared it is simply fed into the machine tool by the operator. With this system he can be relatively inexperienced. The required skills are built into the system and recorded on the tape.

While many problems can be anticipated in getting into production with this type of equipment, none of them are insurmountable. Cooperation of electronics designers, machine tool people and the user will smooth out the path to more rapid application.

From discussions given at the National Production Meeting and Forum March 1957, Society of Automotive Engineers, 29 W. 39th St., New York 18, N. Y.

▼ ▼ ▼

Production Techniques for Military Mobilization

By Kenneth L. Wilson
Design Standards Engineer
Rocketdyne Div.
North American Aviation, Inc.
Canoga Park, Calif.

Present techniques would not suffice if the demand for machined components was multiplied by approximately 50 and the number of machine tools remained constant or nearly so. Many of this avalanche of parts must be made from tough new alloys. Limits of accuracy demand increased skill and care on the part of operators.

To cope with this set of conditions it is necessary for industry to make many changes. These include:

1. Encourage research in cutting tool materials, cutting fluids, processes affecting machinability and other machining conditions.
2. Bridge the gap between research and production utilization of research findings.
3. Determine rake angles, speeds and feeds.
4. Improve machine tools, emphasizing rigidity, smoothness of traverse and versatility.
5. Provide accessories for chip and coolant control and vibration dampening.

Such changes in industry approach to these problems of a great potential increase in military production would do much to improve the country's state of preparedness.

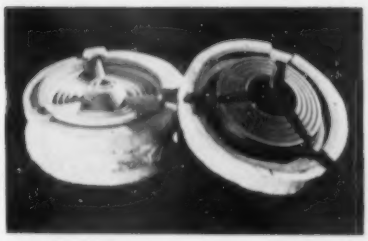
From a paper given at the Western Metal Congress, American Society of Metals, 7301 Euclid Ave., Cleveland, Ohio, 10th Western Metal Congress.

▼ ▼ ▼

Use of Plastics In Prototype Models

By Edward Ferrari
Industrial Design Section
General Electric Co.
Bridgeport, Conn.

Industrial design as it is known today has definitely taken its place as one of the means of cultural expression in the civilization of this era. Artistic expression in the past was always assisted by artisans, craftsmen and tradesmen. This relationship exists now between the model maker and the designer who comprise the staff of a design studio.



Cured elastomer and cap removed from plaster piece mold showing the cast plaster model.

In the past the craftsman made use of the materials available in his locality which were known to him. Today he has at his disposal all the materials of the past plus the constant development of new ones. New materials are being applied to the techniques employed in producing design and prototype models. The progression from clay models into plaster and finally into plastic is the subject of this discussion.

Mold design also employs plaster, plastic and flexible elastomeric mold materials. Another development is an electroformed mold. The use of casting resins includes phenolics, epoxies, furans, clear cast allyl polyesters and acrylic-styrene monomers. Mold parting agents are also included. Plastic tooling demonstrates the use of plastic dies in hand forming and electroforming metal parts.

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Vacuum-formed acrylic mixer bowl (left), furane vacuum-forming mold, and (right), cast polyester bowl.

use of silvering by reduction and subsequent electroplating. Vacuum forming, hobbing of acrylics and plastic fabrication of parts are important techniques. Plastic master models are especially valuable for guide models in production tooling.

From a paper presented at the January 1957 annual meeting (St. Louis) of the Society of Plastics Engineers, Inc., 34 E. Putnam Ave., Greenwich, Conn.

▼ ▼ ▼

Frankness Needed in Employee Communication

By James F. Stiles, Jr.
Treasurer and Chairman of the Board
Abbott Laboratories
Chicago, Ill.

Communication is the most important factor in employee relations, but it must be a two-way street.

General rules in talking to employees are as follows: Be sure the communication is something that will be of direct interest to the employee, not propaganda. Be sure the answer to any question is the truth and nothing but the truth. If impossible, state frankly that the answer is not known. In all relations try to be personal but not paternalistic. Search for the area of agreement and build on that.

Before God every man is equal. So far as his assignment is concerned, every employee's job is just as important to the welfare of the company and himself as anyone else's. He is an individual and should feel that he belongs.

The employee wants to grow. He should feel that he can make progress. As he sees others get promotions, if he recognizes in them the ability that justifies such responsibility, it inspires him with the idea that there is a future, that only the size and progress of the company limit his possibilities.

From a talk given before the Midwinter Personnel Conference February 1957, sponsored by Industrial Relations Assn. of Chicago, and American Management Assn., 1515 Broadway, New York 36, N. Y.

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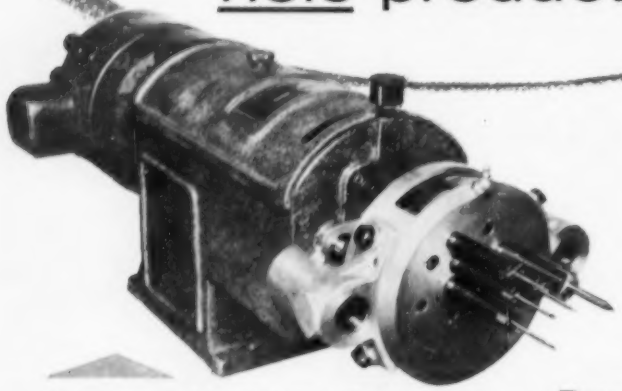

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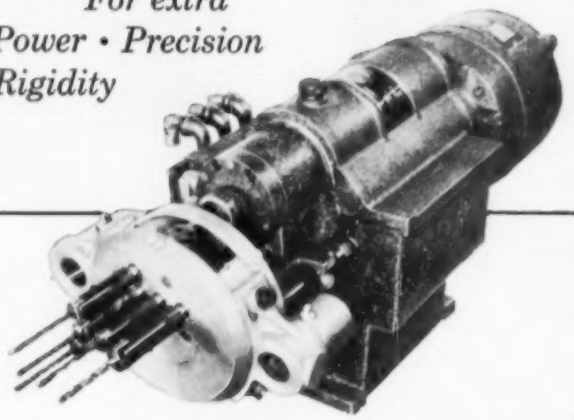

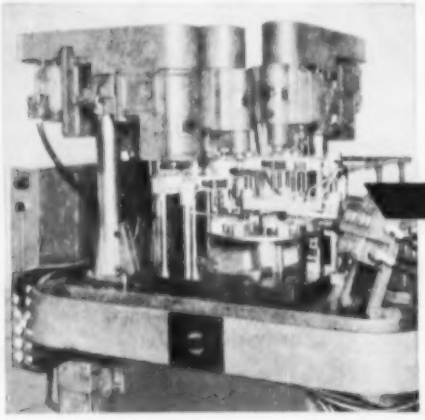

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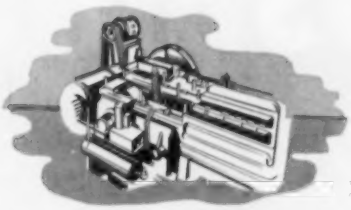

"For three weeks their production was zero"...

A midwest plant was faced with a serious production problem in aluminum extrusion. The operation, on a ⅜" cold upset extruder, was to form a clinching cap for a metal screw. In three weeks of experimentation they did not produce one acceptable product, although they had tried a variety of piercing tool lubricants, including both oil and wax.

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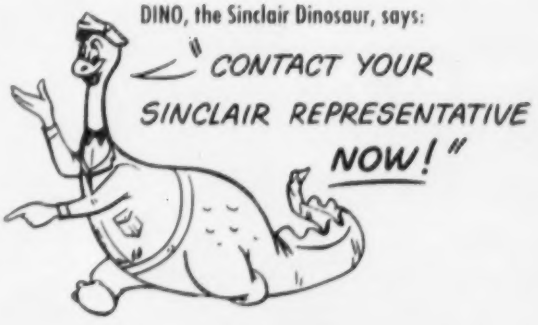
If you have a lubrication problem in your machining operation, call on the experience of a Sinclair Lubrication Engineer. Contact your local Sinclair Representative, or write to Sinclair Refining Company, Technical Service Division, 600 Fifth Avenue, New York 20, N. Y. *There's no obligation.*



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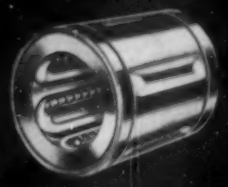

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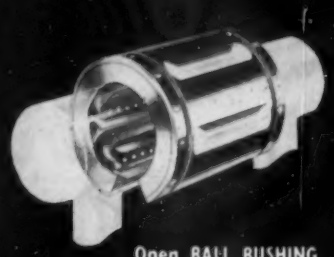

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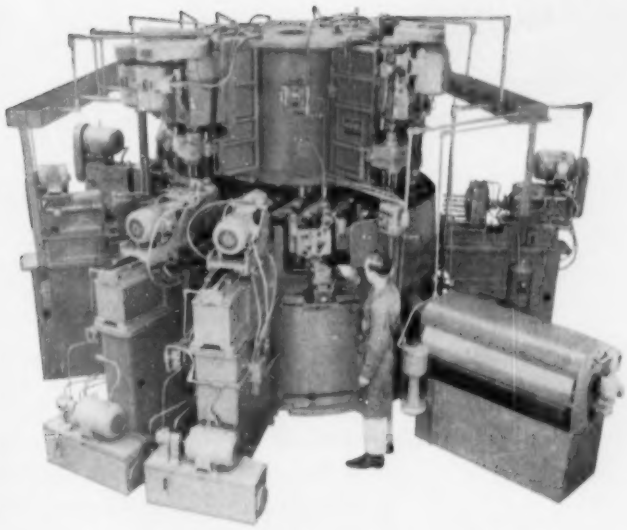

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The new intricate production giant shown above is also a triumph in metalworking flexibility. Designed for a leading appliance manufacturer, the MORRIS Model 334-S High Production Machine processes one-cylinder or two-cylinder housings at the rate of one every 30 seconds.

Yet there's no model change-over problem! The MORRIS completely automatic "special" machine uses a MORRIS basic center column machine equipped with an 84" dia. table, an 18-station automatic hydraulic index, and MORRIS Unit-Type Machine Tools.

A total of 47 spindles, mounted on three 8-inch way type units, six No. 2 CAM-MATIC Drill Units and eight AIR-OIL-MATIC Drill Units, are used to mill, drill, counterbore, spot face, bore, ream and tap housings.

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- Adjustable Feed, Stroke and Rapid Approach
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- Wide Range of Spindle Speeds • Convenient Controls
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Designed for a wide range of drilling, reaming, chamfering, spot-facing, hollow milling, centering and related operations, the unit can be mounted in vertical, angular or horizontal positions. Controls may be set to provide almost any sequence of operation. Available for use in special purpose machines like the production machine illustrated.

Now Available Equipped for

GUN DRILLING

with infinitely variable spindle speeds and feeds; speeds to 8000 rpm, feeds to 40"/min. with 6" or 9" stroke. Sliding base available for 6 or 9" movement. Write for details.

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TRIGGER-RELEASE levers on 5 more

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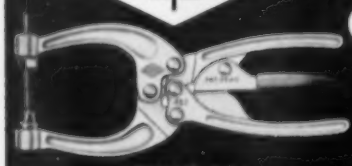

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Trigger-Release levers also available on DE-STA-CO Toggle Clamp Models 461, 462-S, 463, and 463-S (jaw spans ranging from ½" to 3").

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• Provides rapid horizontal measurement to the order of .0002″ for toolroom as well as production use. Simplifies gaging of larger parts—less need to reposition.

• Slotted worktable—19¼″ x 8″—permits use of standard fixtures for staging wide variety of parts. Throat clearance is 14¼″. Maximum lens height above table, 4¼″; minimum, 2⅛″.

THE Model 14-6 is equipped with the same high-quality, precision optical system as all other Kodak Contour Projectors. Kodak's famed Ektar Projection Lenses and rigidly built lens mounts and housings insure accurate performance year after year. A full 14-inch viewing screen covers a field of 1.4″ at 10× magnification. Coated lenses which increase light transmission—plus a special Fresnel lens back of the screen—give a bright image, permitting you to use the Model 14-6 anywhere in the plant. Accessory projection lenses provide a choice of six magnifications (10×, 20×, 31¼×, 50×, 62½×, and 100×). All lenses are quickly interchangeable, seat positively for precise rated magnification. Air-cooled lamphouse and simple, handy controls assure operator ease and comfort.

Vertical illuminator, surface illuminator, six-lens turret, rotating screen with protractor ring, and a mobile base are available as accessories. For further information about the new Kodak Contour Projector, Model 14-6, write to:

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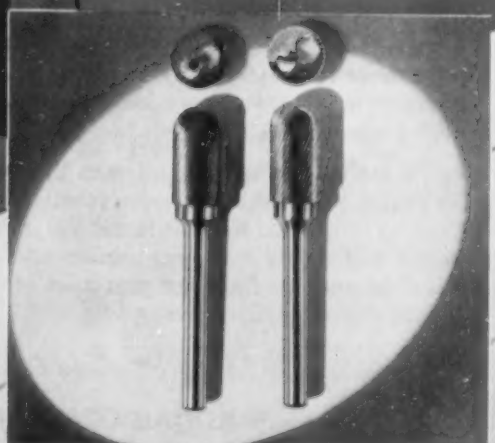
NOW *Carbide Burs are* EXPEN



Compare the Atrax automatically-ground carbide bur (right) with the manually-ground bur (left). Note the accurate, uniform fluting, sharp cutting edges and gem-like finish of the Atrax bur.

DABLE!

Automation By Atrax

Manual bur grinding is obsolete. It is a tedious operation, costing much more than Atrax automatic grinding. Flute uniformity depends entirely upon the skill and patience of the operator.

For the first time in the history of metalworking, carbide burs are being produced completely automatically! The manually-ground bur, costing 10 to 20 times more than high speed steel, is obsolete. Exclusive Atrax automated grinding is many times faster than hand grinding . . . cuts time and labor costs so low that Atrax Carbide Burs are now expendable tools!

Manual bur grinding is an expensive, time-consuming operation, much less accurate than Atrax automated grinding. Atrax Automatic Bur Grinders produce precision carbide burs—eliminate human error—insure absolute uniformity of bur size, shape, concentricity and fluting. Automated bur grinding is an exclusive Atrax development—proof again that Atrax, the leader in solid carbide tooling, can save money for every user of carbide and high speed steel burs!

Send for the new Atrax Catalog listing more than 850 standard Carbide Burs . . . products of Automation by Atrax.

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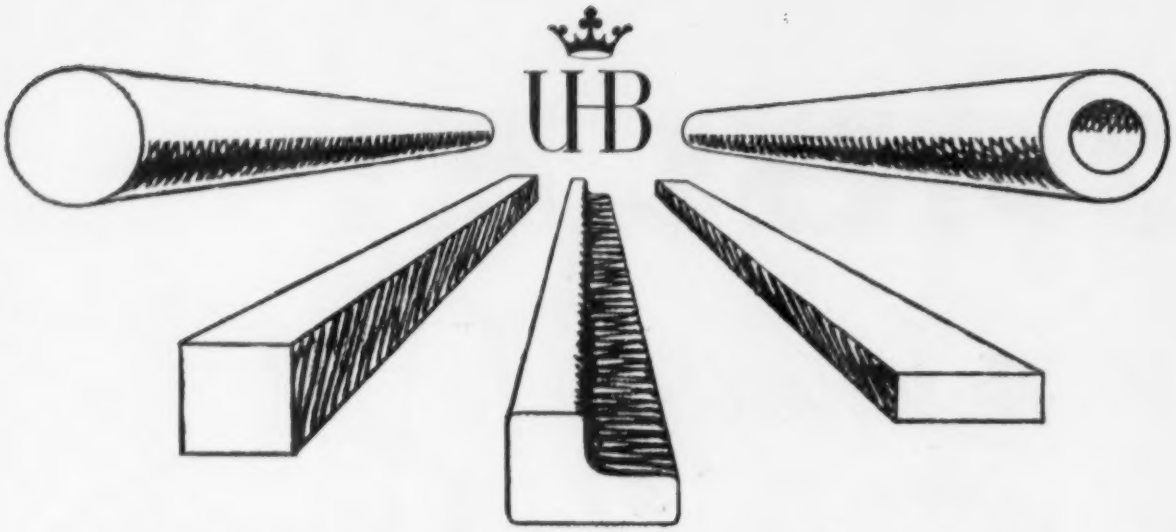

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	Extra Quality	W1	UHB EXTRA
	Extra Quality	W2	UHB-VA
Shock Resisting Tool Steels		S1	UHB-711
		S5	UHB RESISTO
Cold Work Tool Steels	Oil Hardening Type	O1	UHB-46
	Medium Alloy Air Hardening Type	A2	UHB-151
	High Carbon, High Chromium Types	D2	TRI-MO
		D3	TRI-VAN
Hot Work Tool Steels	Chromium Base Types	H12	UHB SPECIAL
		H13	UHB ORVAR
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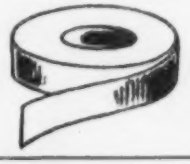
One call—to Uddeholm—is all you need to get the exact type of tool steel you want. And get it fast. You won't have to check other sources or accept "close" substitutes. For, in Uddeholm tool steel you'll find over 2800 different combinations of size, shape, grade and finish—one to meet *every* individual requirement. This variety includes drill rods, hot rolled and flat ground stock, plus Uddeholm's economical hollow tool steel and large-size sectional die steel. Added to this is the inherent Swedish quality that will reappear in *your* product—quality Uddeholm customers have come to "swear by."

Uddeholm Swedish Strip Steel is made from one of the world's purest iron ores—must pass a selective system of rigid inspection. This guarantees you a cold-rolled strip steel of consistent uniformity in composition, flatness, fine finish, edge straightness and dimensional tolerance accuracy. Widths range from ⅛" to 16¼", thicknesses from .001" to .125". Tolerances down to .00008" are possible. Applications include band saws (metal, wood and butcher), clock springs (flat and coil), intricate machine parts, flapper and flutter valves, Stainless Steel products, shock absorbers, razor blades, feeler gages, reeds, knives and many others.



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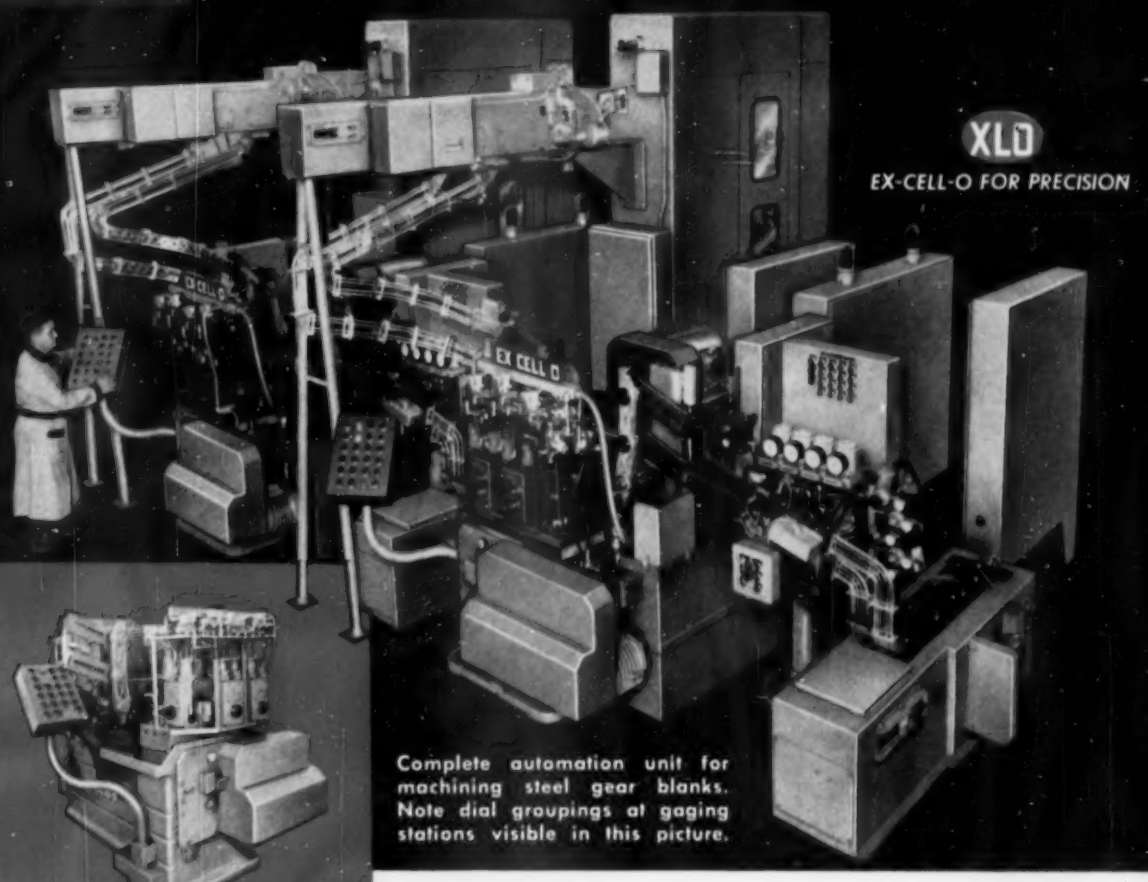
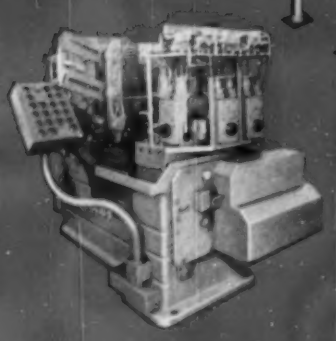
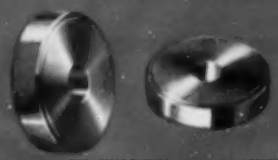


Complete automation unit for machining steel gear blanks. Note dial groupings at gaging stations visible in this picture.



Ex-Cell-O Style 312 Cam Boring Machine adapted for automation. Components on cross slide automatically adjust tools to hold specified limits.



Typical gear blanks after automatic machining is completed.

Standard Ex-Cell-O Machines Handle Automatic Operations

Take these cam boring machines, for example: they are standard Ex-Cell-O 312s. When a customer's production schedule called for an unusually high per hour output of steel gear blanks Ex-Cell-O engineers incorporated these machines into an automated setup.

Included in the new setup: two cam-operated Ex-Cell-O Precision Boring Machines, two Gear-O-Mation storage-distribution units, three gaging stations.

The boring machines finish all the surfaces of the gear blanks: face both sides, chamfer both inner and outer edges, bore the central holes and turn the outside diameters. Tools are adjusted automatically to maintain required tolerances. Gage units automatically check parts prior to entering the machining stations, and the storage-distribution units provide space for a bank of parts at each machine station.

If you're interested in automation, but are held back by the high cost of specially designed machine tools, call your nearby Ex-Cell-O Representative today. Perhaps a standard Ex-Cell-O machine tool setup can be adapted to your automatic operation requirements. Or, if you prefer, contact Ex-Cell-O in Detroit directly.

EX-CELL-O
CORPORATION
DETROIT 32, MICHIGAN

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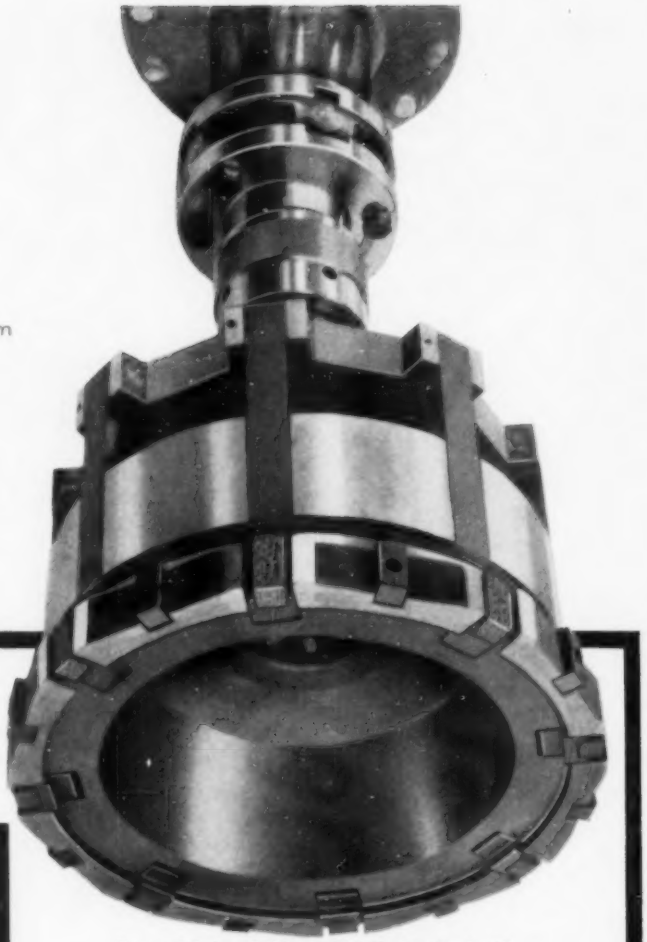
BARNESDRIL

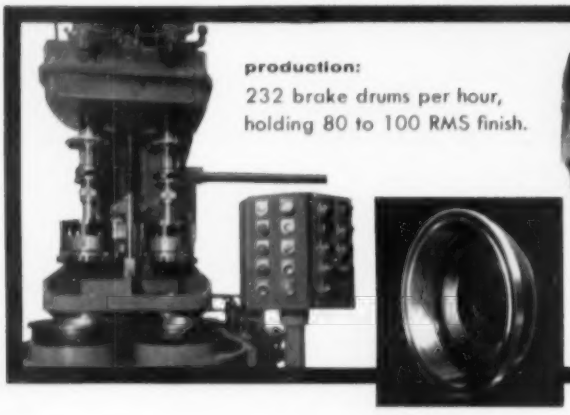
special honing tool

answers unique finishing problem

- **removes taper**
- **corrects out-of-roundness**
- **applies selected finish**



Barnesdril Special Blind-End Honing Tool with Adjusting Head utilizing Plas-T-Clad stones.



production:
232 brake drums per hour, holding 80 to 100 RMS finish.

For the first time it is possible to remove taper, correct out-of-roundness and apply a honed finish, all in one operation. The honing tool that does all these things has been developed by Barnesdril engineers, specifically for a brake drum manufacturer.

The drums represent a blind end bore of 11" in diameter and 2¼" deep. In order to reproduce the specified requirements, Barnesdril engineers designed a special honing tool, Model HFB-8. This tool is a Special Blind End Lever type honing tool, utilizing eight clamp-type stones. The tool removes .003" to .005" stock from the sides of the brake drum. The finish is held between 80 and 100 RMS and the bore is honed diametrically straight.

Two of these tools are mounted on a 2-Spindle Ram Type Machine that provides a positive stop and dwell for blind end honing. Final production is 232 drums per hour.

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Send us your short-run pieces, with specs and finish requirements for prompt honing by expert technicians.

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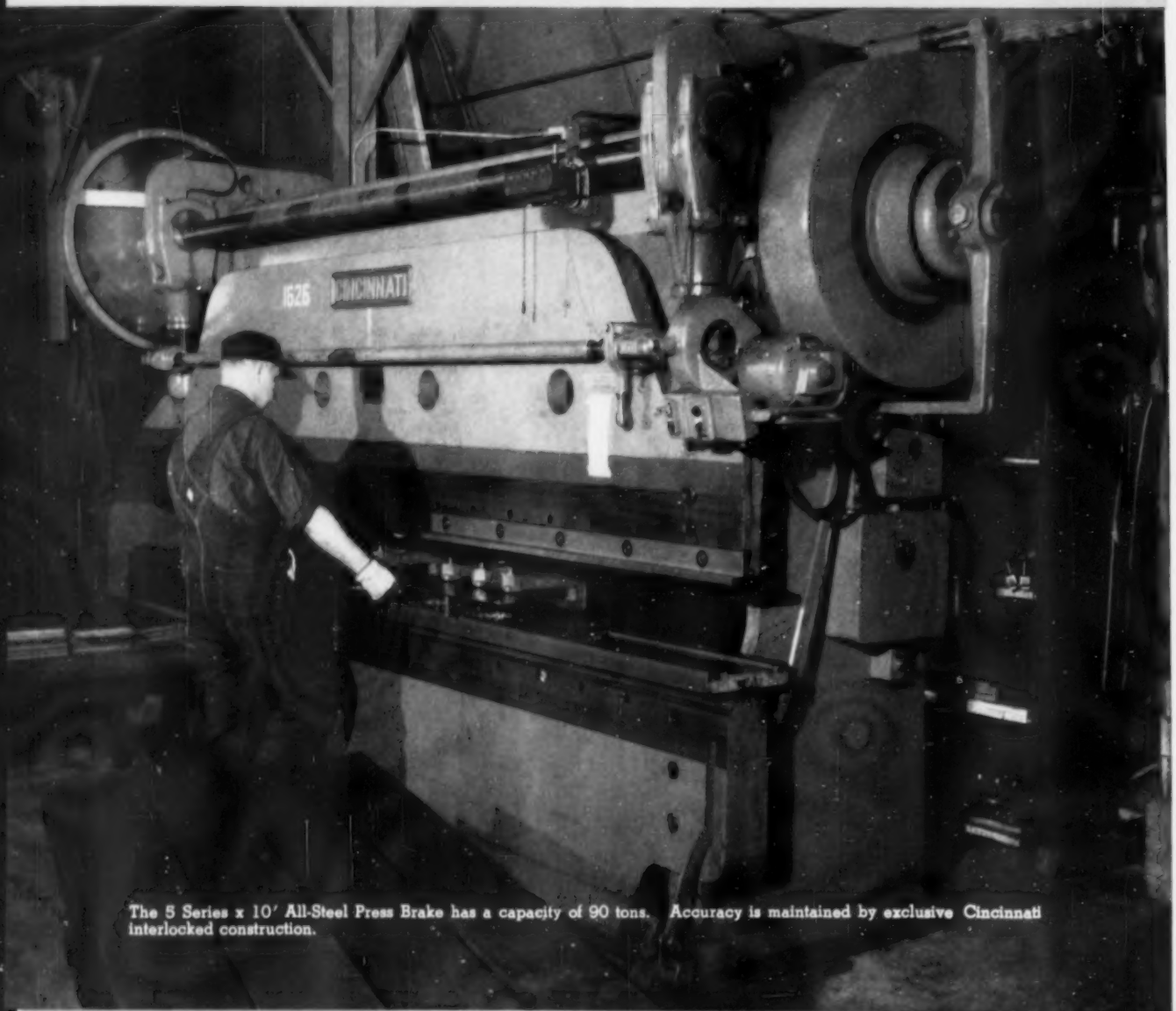
...at **DE WALT INC.** Lancaster, Penn.

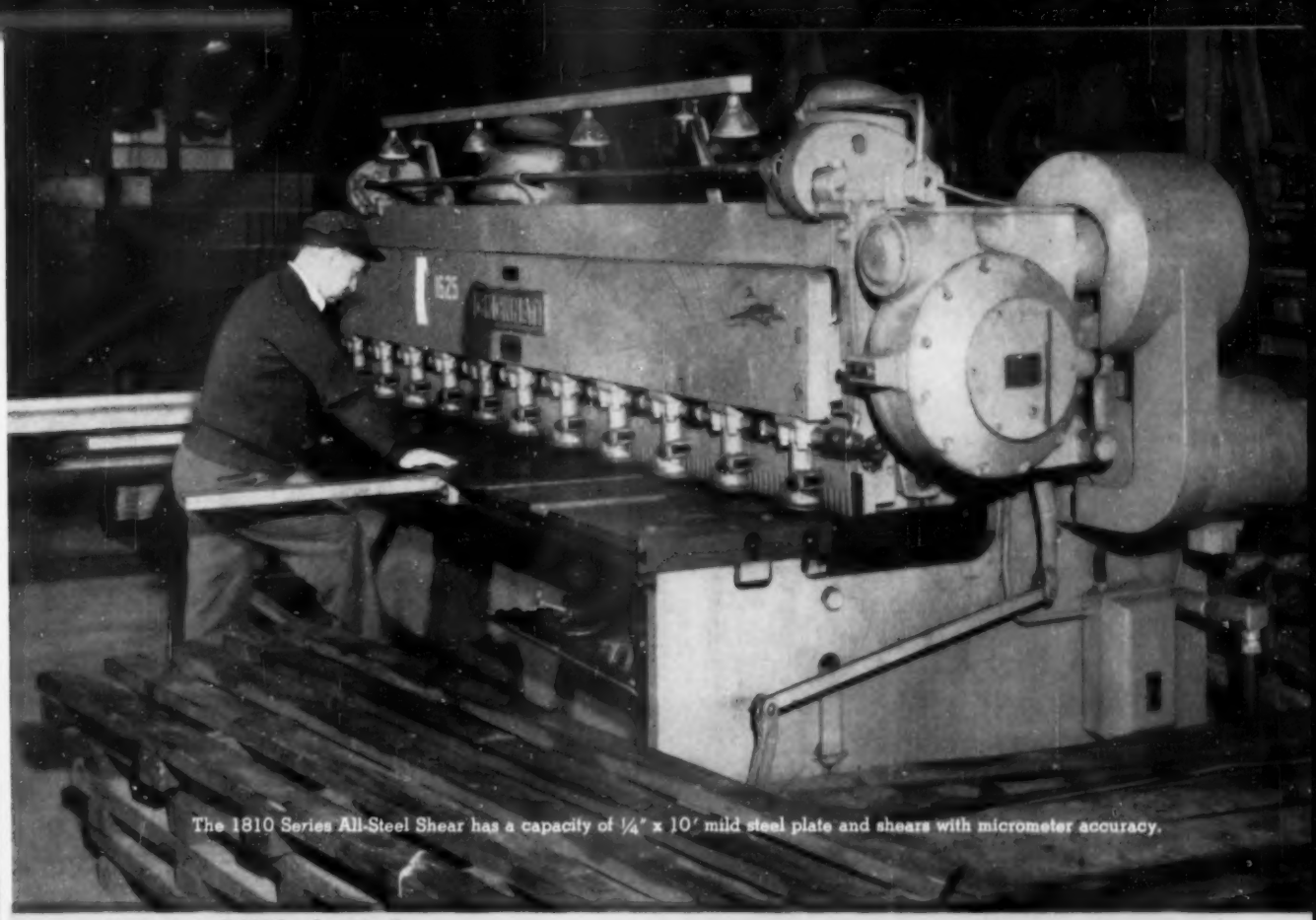
The steel bases of all DeWalt woodworking machinery must be perfectly square, flat and true. Both home shop and heavy duty industrial machines are produced on the Cincinnati Shear and Press Brake shown.



The 5 Series x 10' All-Steel Press Brake has a capacity of 90 tons. Accuracy is maintained by exclusive Cincinnati interlocked construction.

Representatives in major industrial centers

City _____ Zone _____ State _____



The 1810 Series All-Steel Shear has a capacity of ¼" x 10' mild steel plate and shears with micrometer accuracy.

Photos courtesy DeWalt Inc., Lancaster, Pa.

This performance story from DeWalt Inc. tells of improved quality and reduced costs. We quote: "Before purchasing the Cincinnati Shear and Press Brake, we bought formed channels and arc welded them together at the seams. We now buy sheet steel stock—then cut, punch, form, and spot weld the steel bases in our own plant. We have ***reduced costs on this operation by over 1/3*** on the first run employing these methods, and expect costs to diminish still more as operator familiarity and efficiency increase. In addition to the cost factor, it was previously difficult to maintain precision flatness in the tables. Using the new methods and the Cincinnati machines, we now have no difficulty."

Note the improved design of the Model MB "Power Shop" machine shown at right above. The new, improved cabinet is now produced on the Cincinnati Shear and Press Brake at an ***overall cost reduction of 15%***. Previously the cabinet at left was a purchased item.

Write Department E for Catalog B-4R and Catalog S-7R and consult our Application Engineering Department about your production problems.

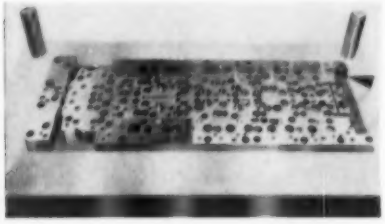
THE CINCINNATI SHAPER CO.

CINCINNATI 25, OHIO, U.S.A. SHAPERS · SHEARS · PRESS BRAKES

Holes

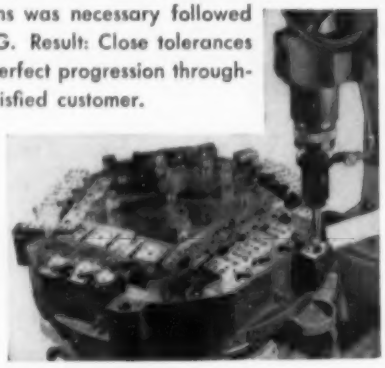
JIG GROUND with *Vulcanaire*

Provide yourself with this inexpensive* instrument for use on your present equipment and JIG GRIND with a guarantee.



41ST year of Vulcan service.

A seven station die from Vulcan's contract Tool Room. Standard sized punches and buttons were used. But since forming and piercing operations were involved hardening of the sections was necessary followed by JIG GRINDING. Result: Close tolerances held easily and perfect progression throughout — another satisfied customer.



Borrow our instructive 11 minute movie on Jig Grinding.

A five station indexing fixture from Vulcan's contract Tool Room. Using a jig borer index table with the Vulcanaire 5 indexing holes and 35 locating and clamping holes were JIG GROUND in place. Result — eliminated all close locating and dowelling of individual parts, and of course hours of time.

*Vulcanaire equipment pays for itself on the first job.

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Engineering, Processing, Designing . . . Special Tools . . . Dies . . . Special Machines . . . Vulcamatic Transfer Machines . . . Automation . . . including the Vulcan Hydraulics that Form, Pierce, Assemble and Size . . . Vulcanaire Grinding Heads . . . Motorized Rotary Tables . . . Plastic Tooling . . . Vulcanaire Jig Grinders.

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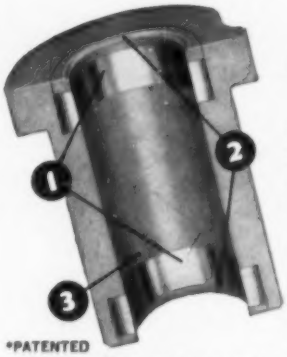

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1. Tungsten carbide rings at the points of wear; 2. Steel rings protect drills and carbide; 3. Special hardened alloy steel body.

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He wants rugged construction — an air cylinder that will stand up day in and day out with minimum requirements for service and repairs.
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AKRON 9, OHIO

This free booklet offers interesting data for the design engineer. Write for it today. Address Dept. TE-557. Ask for Bulletin BM-25. The Bellows Co., Akron 9, Ohio. In Canada: Bellows Pneumatic Devices of Canada, Ltd.

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A FEW POUNDS make a big difference when jigs have to be moved manually several times an hour.

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Lightweight magnesium tooling plate costs less to buy, less to fabricate and less to use

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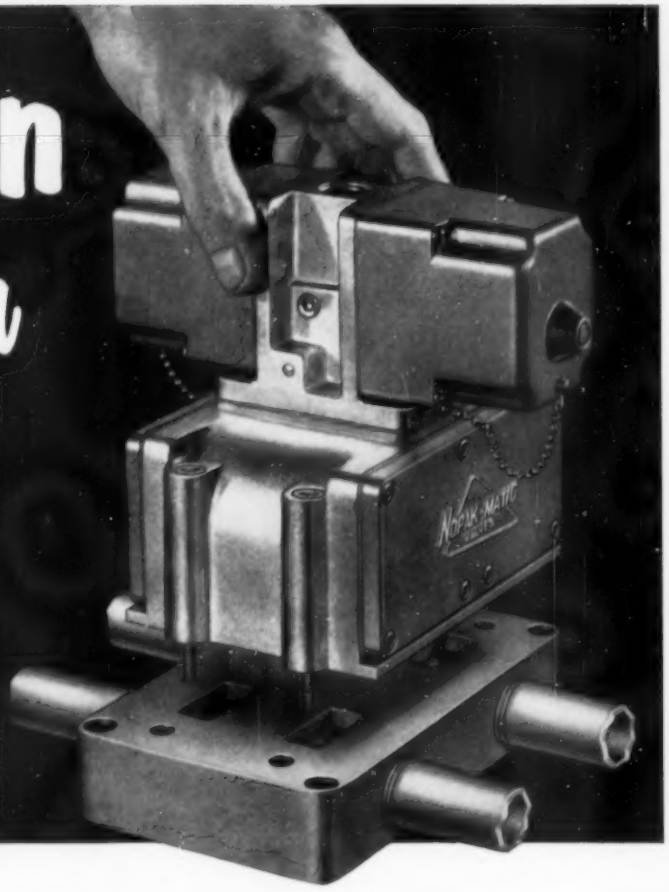

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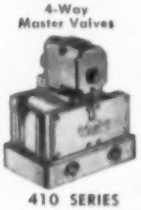
Single Solenoid
Pilot Operated



410 SERIES
4-Way
Single Solenoid
Pilot Operated

320 SERIES
2-, 3-Way
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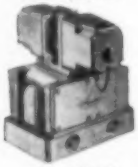
Pilot Operated



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New Nopak-matic valves provide millions of trouble-free operations. But even should maintenance be necessary, it's faster and easier with Nopak-matic. Here's why . . .

- All models are subplate mounted. To remove a valve from the line takes less than two minutes. Four screws are loosened, the valve removed. Piping is never disturbed.
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***NOPAK-MATIC* valves meet *all* J.I.C. Standards**

CATALOG 105 describes in detail all the Nopak-matic Plus Values and gives complete installation and parts data. Send for your catalog now and it will be forwarded promptly!

NOPAK *VALVES and CYLINDERS*

GALLAND-HENNING NOPAK DIVISION • 2750 South 31st St. • Milwaukee 46, Wis.

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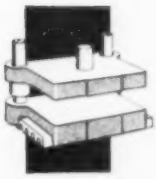

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Results in

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The process of Super Finishing removes the soft outer skin (appx. .0002-.0003) caused by the heat induced as a result of grinding.

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Super Finishing, long a prerequisite in the Automotive and Aircraft Industry for precision bearing surfaces, is now a standard on Superior guide pins. With Super Finished guide pins ideal clearances can be maintained due to a greater bearing surface.

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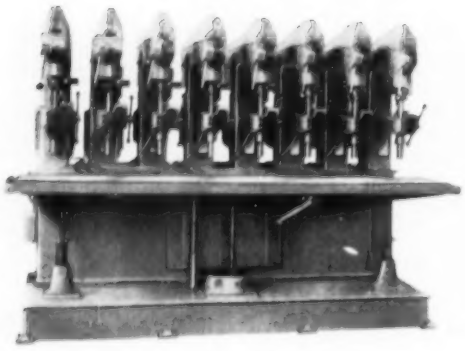
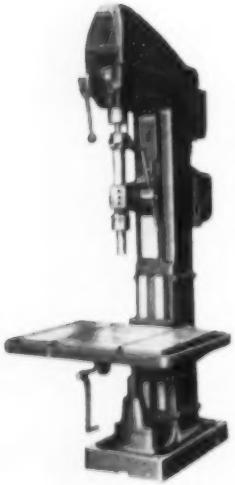
Whatever your light and medium duty

Avey has the right one

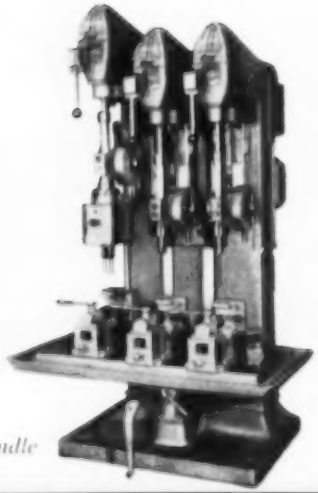


(7) Super 8 spindle

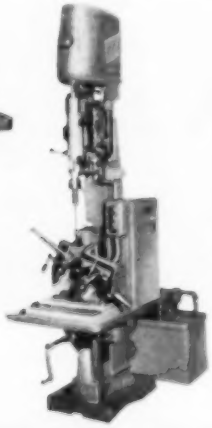
(1) Bench type

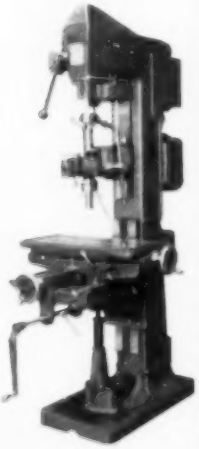


(2) Column type



(3) Multi-spindle





(4, 5, 6) Tool room drills

Whatever your light and medium duty drilling needs, it's a sure bet that the machine you need is made by Avey. The whole Avey line would pack this magazine with pictures—would give you every combination of size, capacity, speed, overhang, and table arrangement to fit your requirements. The ones shown will give you the general idea. Write for literature.

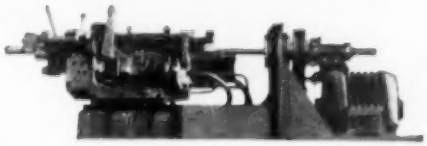
(Figures 1 through 6) Standard Drilling and Tapping Machines. Capacities in cast iron from very small numbered drills to 1½″; 6 or 8 speeds up to 12,000 rpm; No. 32 Jacobs chuck to No. 4 Morse taper; 4 feeds; 1 to 6 spindles; column or bench type; wide range of swing. Featuring such "bonus" advances as micrometer stop collar; telescoping spindle guard; dynamically balanced rotating parts; rack and pinion operated motor plate; large tool and die shop tables; and Avey's pace-setting spindle construction.

(4, 5, and 6) Avey tool room drills, built in No. 2 and No. 3 BMA-6 sizes. Large table 34″ x 25″; round table 18″ diameter; compound table 25″ x 12″.

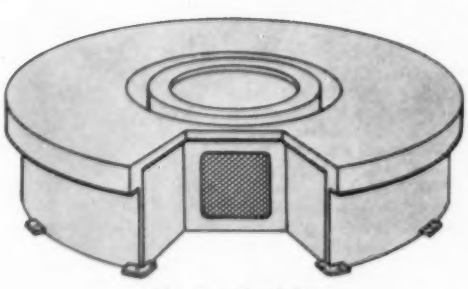
(7) Super 8 Spindle Drilling and Tapping Machine, No. 2 Morse taper. Power lift to table by push button control. Hand feed, power feed, lead screw tapping. Four feeds, 6 speeds. Built-in coolant system.

for Avey makes them all

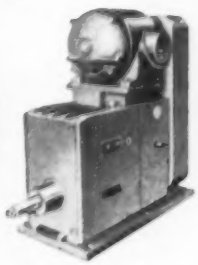
Avey



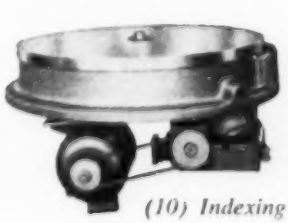
(9) Avey-draulic



(11) Standard base



(8) Cam feed unit



(10) Indexing table

(8) Automatic Cam Feed Units. For drilling, tapping, reaming, hollow milling. Vee belt or gear drive. Nos. 1, 2, and 3 Morse taper. Capacity in cast iron: No. 1, ½″; No. 2, 1″. Mount at any angle. Fully or semi-automatic. Self-contained, tamper-proof.

(9) Avey-draulic feed unit. Automatic withdrawal for chip removal only when necessary during deep hole drilling. Rapid advance, feed, and rapid return. Jump feed attachment available. Standard strokes 12″ up to 30″. Avey's patented Torque-matic control optional.

(10) Automatic index tables. Rapid, accurate indexing to .001″. Even or uneven index patterns obtainable. 16″ to 48″ diameter. All adaptable to Avey standard bases.

(11) Steel Bases. One of Avey's standard line of fabricated bases. Stress relieved, sandblasted, machined, and painted to fit your application. Combine 8, 9, 10, and 11, and you get fast returns on your investment, and a step ahead of your competition!

THE AVEY DRILLING MACHINE CO., CINCINNATI 1, OHIO

drilling, tapping, production machines

BRISTOL socket screws help Army NIKE blast off

We're proud that Bristol Multiple-Spline socket screws were selected for use in the NIKE, *first truly operational U. S. guided missile.*

First, because NIKE and its complex guidance equipment are so important to our national defense.

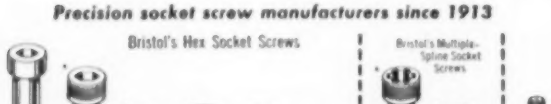
Second, because we know that these Bristol Multiple-Spline socket screws met the most exacting requirements for holding power against shock and vibration. The Bristol-originated Multiple-Spline socket allows these screws to be wrenched up exceptionally tight without danger of stripping the socket.

Bristol Multiple-Spline socket screws, both set and cap, are ideal for critical applications in a host of products, in addition to missiles and guidance equipment: communications equipment of all types, shavers, instruments, vending machines, cameras, desk calculators—wherever ability to take extra wrenching torque is a factor.

Find out about them from your industrial distributor today.

A.6.36

Precision socket screw manufacturers since 1913



Made in sizes as small as No. 0 in Alloy Steel and Stainless Steel. Cap Screws up to 1½".

THE BRISTOL COMPANY, Socket Screw Division, Waterbury 20, Conn.

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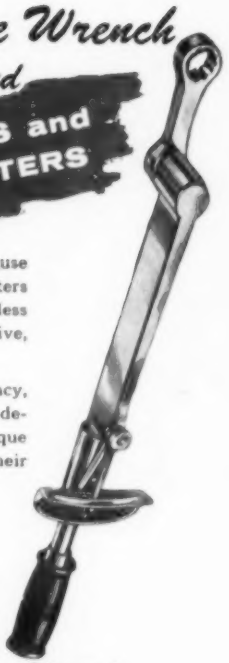
Only **ONE** *Torque Wrench can be accurately used with . . .*

EXTENSIONS and ADAPTERS



It is mechanically impossible to use any Torque Wrench with adapters or extensions (with accuracy) unless that Torque Wrench has a positive, built-in, fixed load position.

This essential factor of accuracy, misunderstood or ignored in the design and manufacture of some torque tools, can completely defeat their purpose.

PATENTED PIVOTED HANDLE FIXES LOAD POSITION

Write for Torque Manual

with formulas tables and explanations for correct use of adapters and extensions.

PA STURTEVANT CO
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UNMATCHED

Repeatability

WITH

Em-re

DIAL INDICATORS

THE ONLY

100% SHOCKPROOF DESIGN

There's never been a dial indicator like the "Em-re." It combines a new and greatly simplified design with a fully jeweled gear mechanism that is indestructible. As a result it gives you readings of previously unobtainable accuracy — accuracy that will repeat itself without deviation through millions of measurements. "Em-re" .00005" and .0001" models, for example, provide repeated readings to an accuracy of better than .00002". And the *completely* shockproof "Em-re" system preserves and *actually contributes to* this repeatability over a lifetime of service. Stocked in 26 models, 8 ranges from .002" to 1.000"; graduations in .00005", .0001", .00025", .0005" and .001". *Also available for accurate indicator testing — the "Master" Dial Indicator Checker.*

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PLEASANT VALLEY, NEW YORK

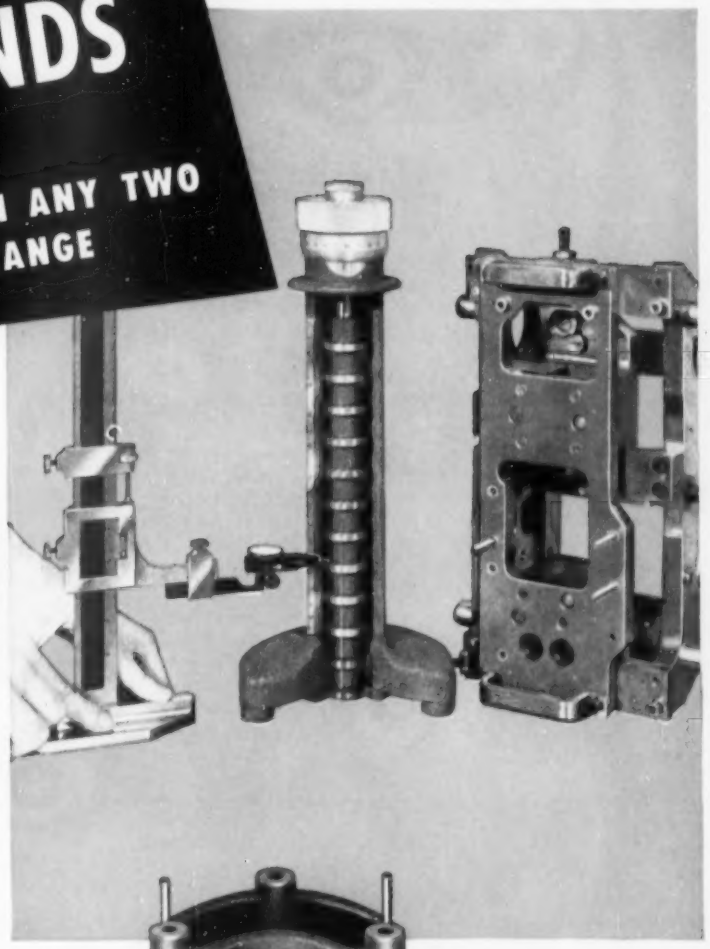
USE READER SERVICE CARD; INDICATE A-5-250-3

SETTING TIME:

10 SECONDS

ACCURACY:

.00005" BETWEEN ANY TWO POINTS IN 12" RANGE



Cadillac PLA-CHEK

SPEEDS ACCURATE INSPECTION from *MINUTES* to *SECONDS*

Designed for easy portability and extreme ruggedness, this 12" Cadillac PLA-CHEK takes little more than 10 seconds to set! Permits surface plate checking and inspections nearly 5 times faster than by ordinary methods.

And, accuracy is assured! Between any 2 points in the 12" range accuracy is guaranteed within .00005".

With a reverse checking plate, a height-gage indicator is easily set for checking the underside of parts. Use of inside micrometers, telescoping and internal cylinder gages gives this gage added versatility. Send coupon TODAY for complete details!

To increase the usefulness of the 12" Cadillac PLA-CHEK Gage, without sacrificing portability, this 6" precision-made riser may be used—upping range to 18".

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CADILLAC GAGE COMPANY
P. O. BOX 3806, DETROIT 5, MICHIGAN

Without obligation please rush complete information on the Cadillac PLA-CHEK Gage line to:

Name _____

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3 SIMONDS Production Saws that say "SOCKO" to High Cost Cutting

INSERTED TOOTH SAW — A real champion for production cutting of steel, brass, copper, aluminum. Alternately beveled and square High Speed Steel Teeth "tri-vide" chips for easy cutting and clearance in large cross-section and high speed sawing operations. The alloy steel plate is tough and shock-resistant. Easy, "do it yourself" replacement of the High Speed Steel Teeth simplifies maintenance.

SEGMENTAL SAW — For smoother finish production cutting or where finer teeth are required for thinner cross-sections. Longer service High Speed Steel segments (tongued or slotted type) in a tough alloy steel plate cut true, fast and free. Teeth are alternately square and beveled for easy clearance of "tri-vided" chips. Sharpen on any automatic grinder.

SOLID TOOTH SAW — For cutting small bars, extrusions, pipes and where narrow kerf is desired. Preferred for occasional cutting because of lower saw cost. Alternately beveled and square teeth for most jobs. Clearance ground and heat-treated to combine longest wear life with maximum toughness. Supplied in Simonds own steel — High Speed, Si-Maloy (Pat.), or Semi-High Speed.

Other High Quality SIMONDS Metalworking Products

HAND HACK SAW BLADES | POWER HACK SAW BLADES | FILES | BAND SAWS | ROTARY SHEAR KNIVES & SQUARING SHEARS | FLAT GROUND DIE STEEL

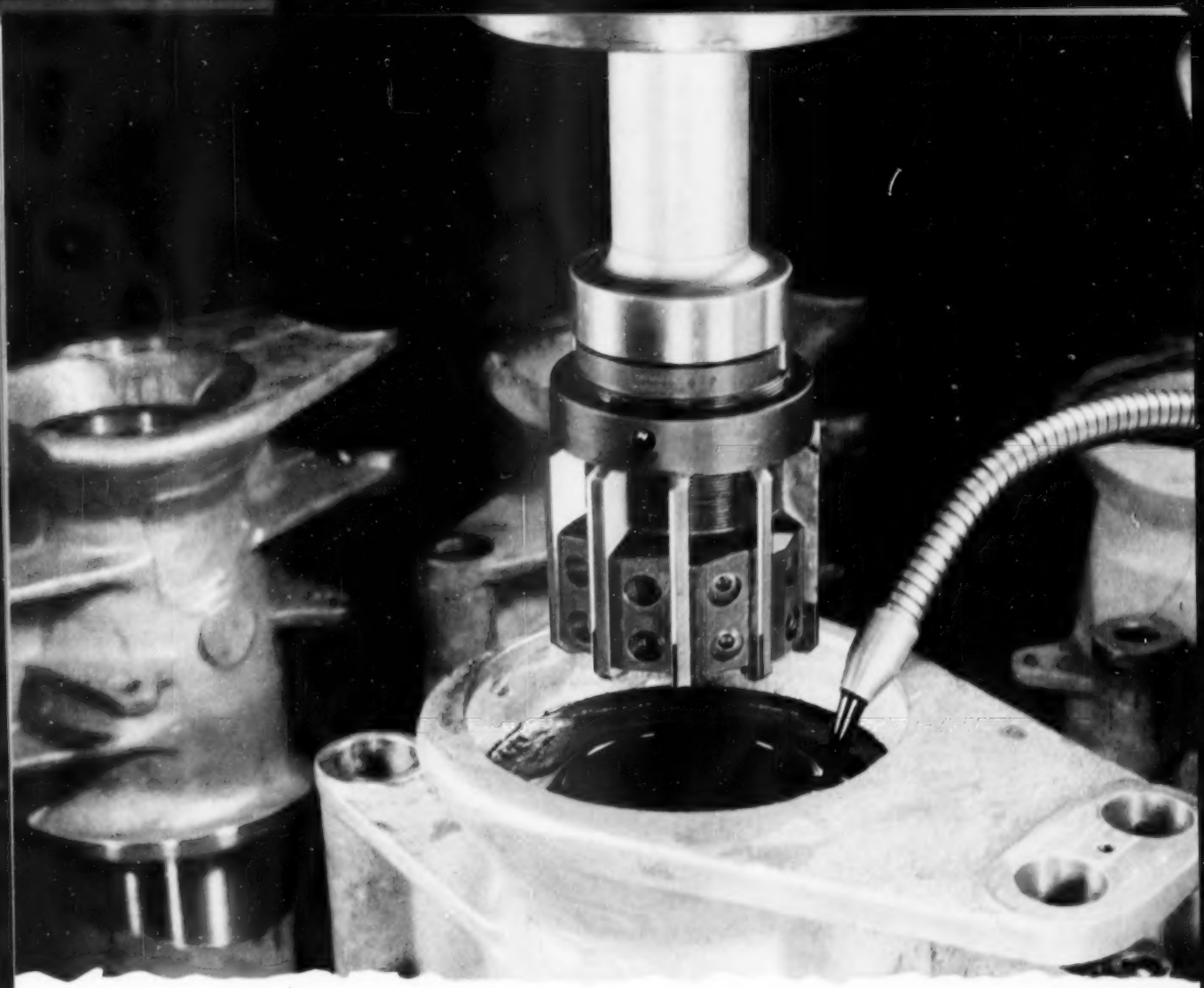
125 YEARS OF GROWTH • 1832-1957

SIMONDS SAW AND STEEL CO.

FITCHBURG, MASS.

For Fast Service from Complete Stocks Call your SIMONDS Industrial Supply DISTRIBUTOR

Factory Branches in Boston, Chicago, San Francisco and Portland, Oregon
Canadian Factory in Montreal, Que. • Simonds Divisions: Simonds Steel Mill, Lockport, N. Y.
Simonds Abrasive Co., Phila., Pa., and Arvida, Que., Canada • Heller Tool Co., Newcomerstown, Ohio



TOOL LIFE INCREASED 400%

CLEVELAND Carbide Tipped Adjustable Reamer sets new high record!

The specifications on this job call for reaming a 4½" hole to a tolerance of .001" and a surface finish of less than 50 R.M.S. (micro-finish). CLEVELAND Carbide Tipped Adjustable Reamers are meeting these requirements day after day... month after month... *and reaming five times as many holes per grind as the conventional high speed reamers formerly used.*

◈ Whenever *you* have a difficult reaming problem, a CLEVELAND Service Representative can help you. Contact our nearest Stockroom, or...

TELEPHONE YOUR INDUSTRIAL SUPPLY DISTRIBUTOR

Request your copy of this descriptive booklet on CLEVELAND Carbide Tipped and Solid Carbide Cutting Tools

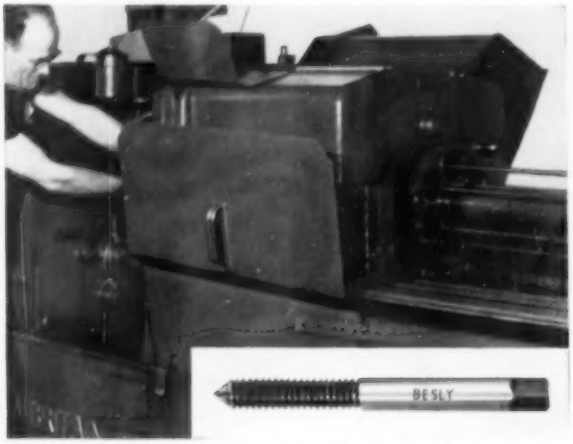
THE CLEVELAND TWIST DRILL CO.

1242 East 49th Street • Cleveland 14, Ohio

Stockrooms: New York 7 • Detroit 2 • Chicago 6 • Dallas 2 • San Francisco 5 • Los Angeles 58

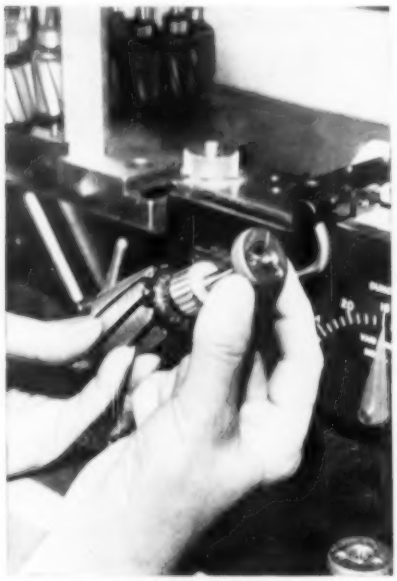
E. P. Barrus, Ltd., London W. 3, England

Cutting Tool and Gaging Methods . . . by BESLY



"ROLLING" THREADS IN COPPER—At Steel Industries, Inc., Crawfordsville, Ind., an automatic screw machine is being set up to size, bore and thread 1500 small, difficult-to-tap copper parts per hour. The Besly ¼-28" "X-Press" fluteless tap, shown, is used. H. M. Oshry, Vice-Pres., states, "Besly 'X-Press' Taps made it possible to use this high production method successfully. We get stronger, better, rolled (pressed, not cut) internal threads with no burrs or chips — longer tool life and fewer rejects."

MODIFIED TO FIT—The Gabriel Company, Cleveland, requires two concentric tapped holes in die-cast aluminum pistons used in their airplane type shock absorbers. Originally these were tapped individually — requiring 18 seconds per piece. To reduce this time, a unique set-up using Besly Taps was developed. A smaller Besly Tap is fitted inside the bored-out center of the larger Besly Tap. Two holes are now accurately tapped simultaneously in 9 seconds.



PRECISION ACCURACY—Bodine Electric Co., Chicago, uses Besly-Metro thread plug, thread ring, plain cylindrical plug and ring gages to assure precision accuracy of parts for electrical motor production. Asked why he uses them, A. Wermund, inspection foreman, says, "Last longer — sturdier built."

CARBIDE TOOLS IN ACTION—Cast steel truck wheels made by Gunnite Foundries Corp., Rockford, Illinois, are rough bored with a Besly BL-12-B5 Standard Carbide Tipped Tool, arrow 1, removing ⅛" to ⅜" of stock. On the same turret lathe a second Besly AL-12-B5 Standard Carbide Tipped Tool, arrow 2, semi-finish bores, removing .030" stock. Metal removal is at 200 S.F.M. at .016" feed. Besly's Engineering Service helped to achieve this efficient, low-cost metal removal set-up.

Prove to yourself that Besly Cutting Tools and Gages produce better results. Put them on trial on your toughest jobs, and check the difference in longer tool life, less down time, fewer rejects and faster production. If you'd like to try Besly tools or use Besly's Engineering Service, see your Besly distributor for details, or write us . . .

Engineering, Service and "Specials" . . . are a Besly Specialty

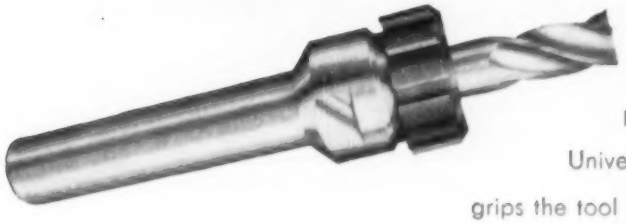
BESLY

BESLY-WELLES
CORPORATION
Est. as C. H. Besly & Co. 1875
118 Dearborn Ave., South Beloit, Illinois

TAPS • DRILLS • REAMERS • END MILLS • TOOL BITS • GAGES
CARBIDE TIPPED TOOLS, BLANKS, TOSS-AWAY INSERTS and HOLDERS

FOR A REAL GRIP

USE UNIVERSAL COLLET CHUCKS



A sure, solid grip on tools is provided by the wrap-around action of Universal chucks because the slotted collet grips the tool on a continuous surface the full length of the collet. Tools can't slip and tool shanks don't get scored. Even tool stubs and broken drills can be used successfully. Sizes range from 1/16" to 1 1/2", with shanks to fit any machine. Simplified design results in low chuck cost to you. Write today for new "complete line" catalog.

197

UNIVERSAL ENGINEERING CO. FRANKENMUTH 3, MICHIGAN

CARBOLOY
MACHINABILITY COMPUTER

- Ends time-consuming tryout runs; saves valuable stock
- Shows you how to get maximum machine output at lowest cost

JUST DIAL IN KNOWN MACHINING DATA... SOLVE TOOL SETUP PROBLEMS IN SECONDS

The Carboloy Machinability Computer accurately predicts how your tools and machines will perform on any job. Faster than any other method of figuring job setups, it calculates the effect of 19 basic machining variables on machine performance, tool life, and output.

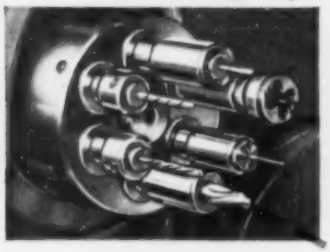
With this information, you can check the accuracy of existing setups, determine new machining standards, eliminate costly pilot runs. With the Computer, you can quickly see how to vary operating conditions to gain maximum efficiency from the cutting tool, the machine, and the operator. Simply set up the known machining variables on the Computer dials . . . then adjust the unknown variable until the Computer shows that the correct setting has been reached.

Hundreds of Carboloy Machinability Computers are now in use throughout industry . . . on jobs ranging from initial setups to trouble-shooting. The Computer is portable and rugged; priced at $495 (f.o.b. Detroit). For more information, or a demonstration in your plant, write: *Metallurgical Products Department of General Electric Company, 11101 E. 8 Mile Blvd., Detroit 32, Michigan.*

Progress Is Our Most Important Product

GENERAL ELECTRIC

Detail of drum turret showing six spindles



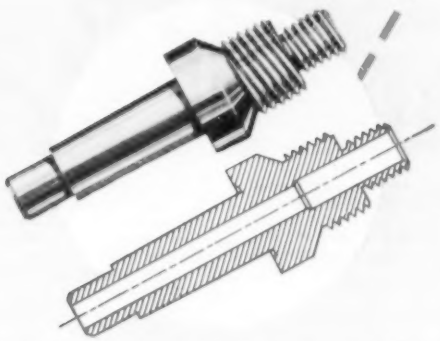
TURRET LATHE VERSATILITY added to SWISS AUTOMATIC PRECISION

ONE MACHINE COMBINES
6-SPINDLE AXIAL DRUM TURRET
WITH 5 CROSS TOOLS

BECHLER SWISS AUTOMATICS

This remarkable combination has resulted in a Swiss Automatic of tremendous versatility. Addition of a six-station drum turret permits a wide variety of set-ups with *simple, standard* tools. The 11 separate tool stations permit production of completely finished, precision parts. Secondary operations are eliminated—output is increased—yet the precise performance of standard Swiss Automatics is retained. These machines are available in three sizes with capacities up to 1¼ inches.

Bechler Model AR-10
⅜" diameter capacity
5 Cross Tools—
6 Turret Stations



Steel precision part produced on AR-10. Diameter—.250", length—.750", 1 single and 1 double lead thread, recess and taper behind shoulder, bores concentric with outside diameters.

TURRET FEATURES

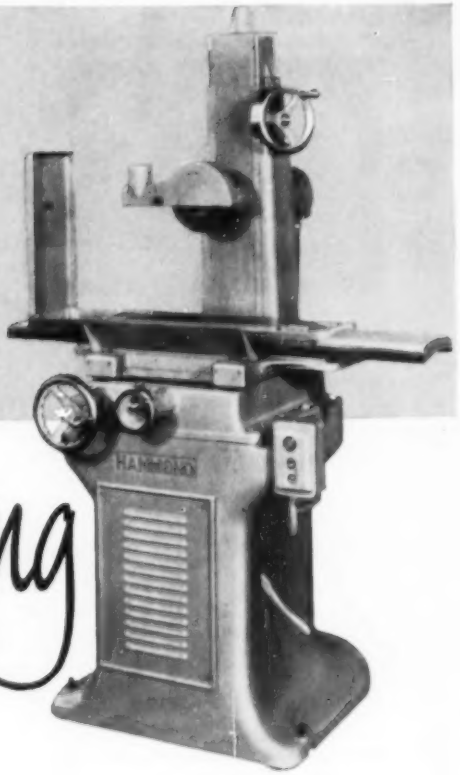
- Six adjustable spindles—rotating or stationary—for centering, drilling, reaming, threading and tapping. Up to 4 of these spindles can be tooled for internal or external threads—right, left or mixed.
- Rapid, hydraulic spindle indexing—operated by standard, adjustable trip dogs instead of indexing cams.
- Accurate tool alignment—turret is securely locked on an extra large disc.
- Idle spindle travel reduced—horizontal turret positioned to suit length of workpiece.

COSA — *nationwide sales and service of precision machine tools —from bench lathes to boring mills.*

COSA CORPORATION, 405 LEXINGTON AVENUE, NEW YORK 17, N.Y.

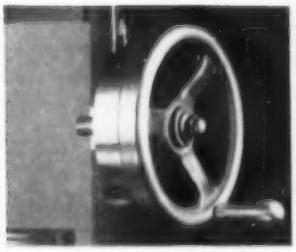
Factory Service: — Bechler Service Corporation — Long Island City — New York

FOOTBURT

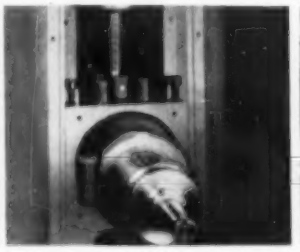


Accurate grinding
for small parts

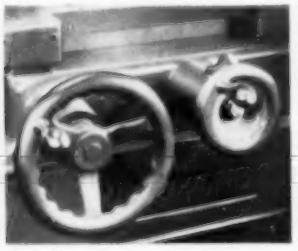
■ The Hammond No. 2, 6″ x 18″, Surface Grinder is a precision tool room machine for use on the most accurate gauge and tool work. The standard spindle is direct motor driven and is mounted on precision preloaded ball bearing. Total vertical adjustment is 10¾″. In and out movement of table is 6½″ with a longitudinal travel of 18″.



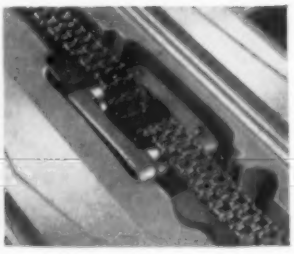
ACCURATE SPINDLE ADJUSTMENT—Standard vertical adjustment of spindle through handwheel is .0005″. With Vernier attachment, spindle can be raised accurately to .00005″.



SOLIDLY SUPPORTED SPINDLE CARRIER—Spindle carrier is moved vertically on double dovetail ways with adjustable tapered gibs.



CONVENIENT HAND CONTROL—Handy wheels for cross travel, accurately gauged to thousandths, and quick acting longitudinal travel.



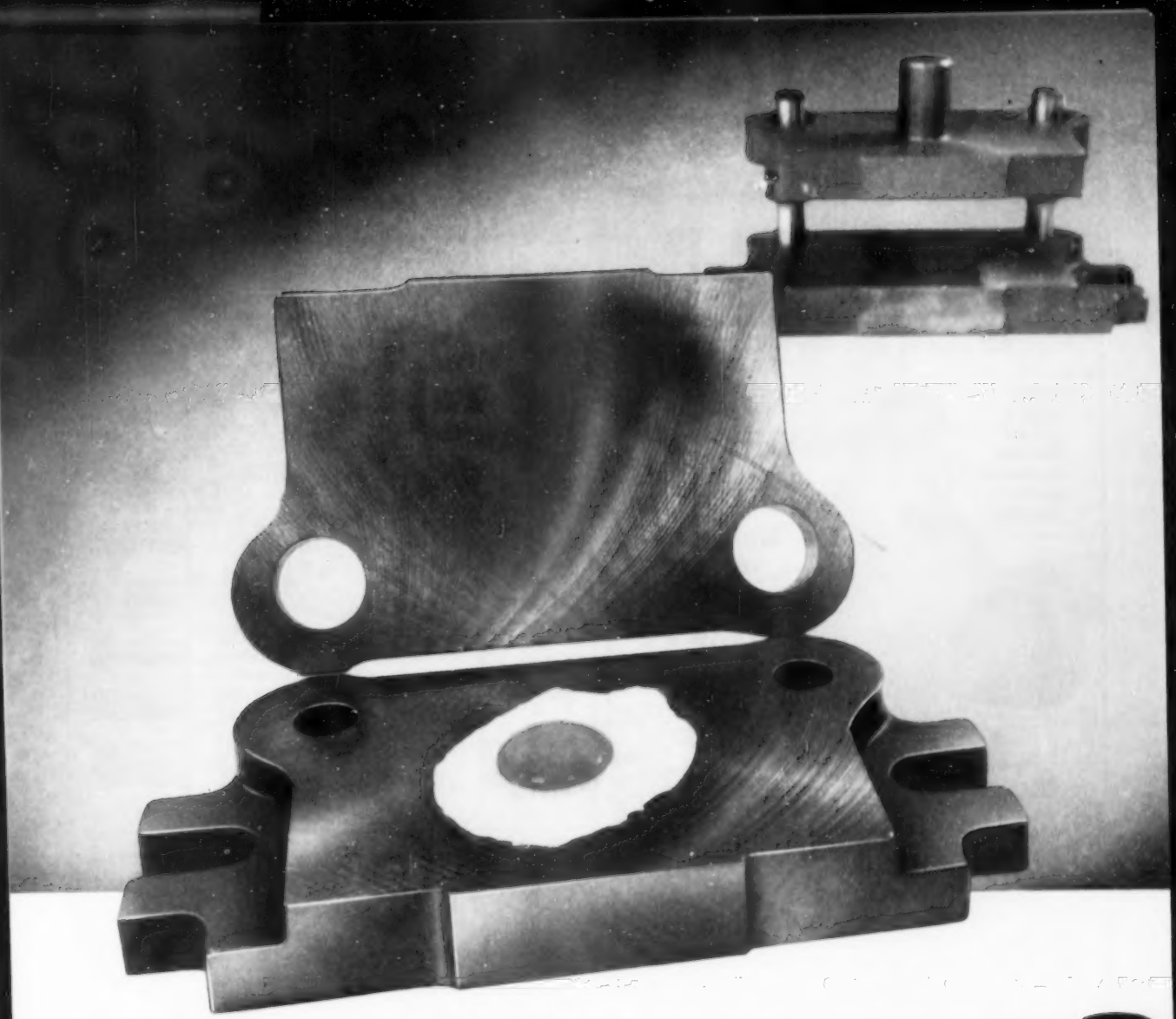
SMOOTH ROLLER CHAIN TABLE DRIVE—Remarkably smooth finish on work without chatter marks frequently found when table is moved by conventional means through rack and pinion.

Write or wire for further information.

THE FOOTE-BURT COMPANY • Cleveland 8, Ohio • Detroit Office: General Motors Building

FOOTBURT

SURFACE GRINDING



WHAT'S COOKING ON DIE SETS?

The egg you've laid, brother, if the job isn't right.

Whether you're the tool engineer or the diemaker, once the die's in the line it has to produce or you've had it. And today it has to produce hundreds of thousands, even millions, of parts to pay for itself.

Obviously the die set is no place to cut corners. It's not only the heart of the die but frequently it's the least expensive part of the die anyway. A few dollars saved here won't go very far spread out over the life of the die, and it can prove costly.

Making quality die sets is our business. Quality means precision and stamina:

Precision for fast, accurate diemaking and lasting production accuracy.

Stamina to assure long, trouble-free operation in the line.

For your convenience, Detroit Die Set stocks over 2000 standard die sets. Our new catalog covers them all, plus details on specials, too. Ask for your copy on your company letterhead today.

OFFICES IN PRINCIPAL INDUSTRIAL CENTERS

Detroit DIE SET CORPORATION

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.0002 T.I.R. OR LESS AT SPINDLE NOSE. .0005 T.I.R. OR LESS ON TEST ARBOR SIX INCHES FROM SPINDLE NOSE

SPINDLE SPEEDS 150 and 250 RPM Other Spindle Speed Pulleys Available

MODEL B943 MOTOR DRIVEN WORK HEAD

No. 11 B & S Tapered Spindle Standard Equipment. No. 12 B & S or No. 5 Morse Available at Slight Extra Cost.

The B943 Motor Driven Work Head is a compact self-contained power unit for internal and external grinding. It is held in position by two T-slot bolts and can be mounted at any convenient spot on the table. The swivel base, which is graduated 90° one side of center and 45° on the other, permits the Work Head to swivel full 360° if desired. Swivel base can be easily removed from head permitting units to be mounted on table without base if desired. The B943 is easily and quickly mounted on other makes of grinders.

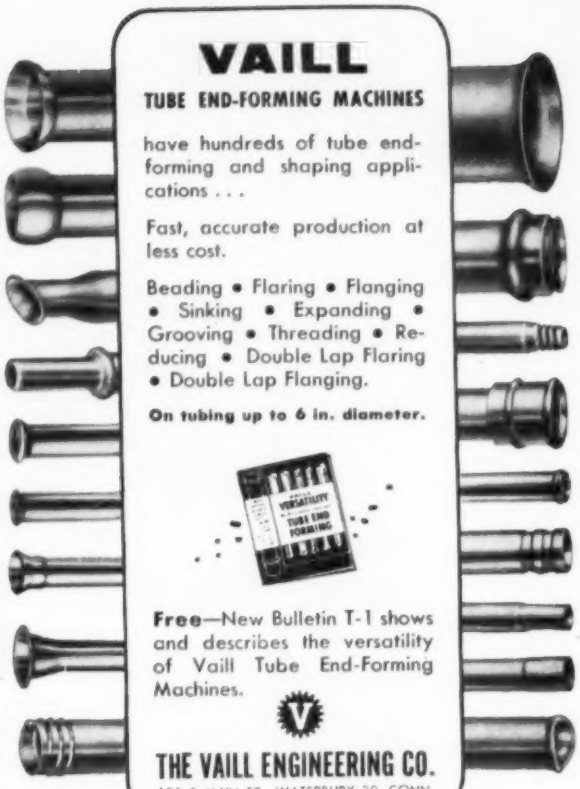
The No. 11 B & S tapered spindle, mounted on ball bearings, is hardened and ground, and is designed to receive chucks, collet fixtures, face plates, straight or tapered sleeves, centers and like equipment. Unit is grease packed at factory and requires no service in the field for the life of the bearings. Streamlined in design, this fixture is quickly mounted and is easy for the operator to keep clean.

The special motor is provided with conveniently located reversing switch which is handy for the operator regardless of the position of the work table or rotation of the work. Motor operates quietly and is fully protected from dust and from any oil entering from working parts.

See this extremely accurate B943 work head at your equipment dealer or write for complete literature.

K. O. LEE COMPANY
ABERDEEN, SOUTH DAKOTA

USE READER SERVICE CARD; INDICATE A-5-260-1



VAILL

TUBE END-FORMING MACHINES

have hundreds of tube end-forming and shaping applications . . .

Fast, accurate production at less cost.

Beading • Flaring • Flanging • Sinking • Expanding • Grooving • Threading • Reducing • Double Lap Flaring • Double Lap Flanging.

On tubing up to 6 in. diameter.

Free—New Bulletin T-1 shows and describes the versatility of Vaill Tube End-Forming Machines.

THE VAILL ENGINEERING CO.
131 E. MAIN ST., WATERBURY 20, CONN.

USE READER SERVICE CARD; INDICATE A-5-260-2

SAVE SET-UP TIME

•

ONLY TWO THUMB SCREW ADJUSTMENTS REQUIRED

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Take Readings From Three Positions:

1. Up to 2" Dia.
2. Up to 5" Dia.
3. Up to 15" Dia.

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OSLUND TIME-SAVING HOLDER

Get Outstanding Results by using with the Oslund Universal Indicator! The indicator with the 360° reading face— visible in any position—ends walking around machine and use of mirrors.

The Oslund Time-Saving Holder } **ALSO** { Fits Federal and Checkmaster Adapters available for Last Word Fits all types of other indicators

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AIR AND HYDRAULIC

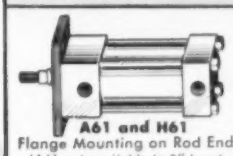
"STANDARDIZED" CYLINDERS

"IN STOCK" for immediate delivery..

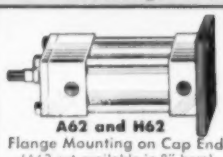
See Miller Bulletins A-105 (Air) and H-104 (Hydraulic) for Complete Dimensions and Engineering Data on these standardized "in stock" sizes and other Custom Miller Cylinders in bores up to 20" and strokes up to 22 ft.

"IN-STOCK" MODELS

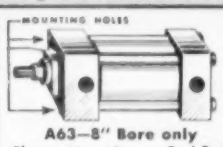
"A" Signifies Miller 200 psi Air Cylinders; "H", 2000 psi Hydraulic Cylinders. Interchangeable Mountings Are Shown In Red On Drawings.



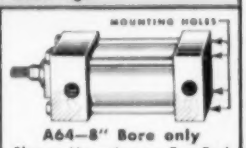
A61 and H61
Flange Mounting on Rod End
(A61 not available in 8" bore)



A62 and H62
Flange Mounting on Cap End
(A62 not available in 8" bore)

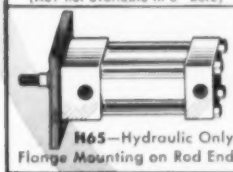


A63—8" Bore only
Flange Mounting on Rod End

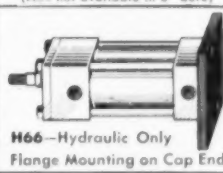


A64—8" Bore only
Flange Mounting on Cap End

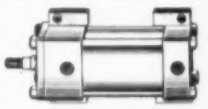
A50 & H50—Tie Rods not extended beyond nuts.
A51 & H51—Tie Rods extended both ends (shown).
A52 & H52—Tie Rods extended. Cap End only.
A53 & H53—Tie Rods Extended. Rod End only.
A54 & H54—Two Tie Rods extended at both ends.



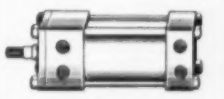
H65—Hydraulic Only
Flange Mounting on Rod End



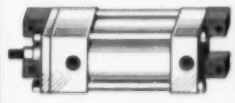
H66—Hydraulic Only
Flange Mounting on Cap End



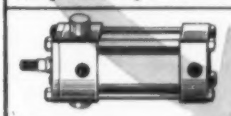
A72 and H72
Side Lug Mounting



A74 and H74
Side Flush Mounting

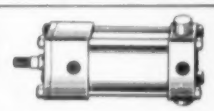


A77 and H77
Side or Foot Mounting

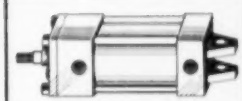


A81 and H81 Trunnion Mounting on Rod End

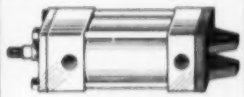
Your Choice of
CAP END CUSHIONED
ROD END CUSHIONED
or
BOTH ENDS CUSHIONED
on all cushioned strokes of all bores shown.



A82 and H82 Trunnion Mounting on Cap End



A84 and H84
Pivot Mounting



A86 and H86
Pivot Mounting

IN STOCK BORES in Inches

	BORES	ROD DIA.	ROD TURN DOWN & THREADS		"IN-STOCK" STROKES (in Inches)
AIR	1½	⅝"	7/16-20	Cushioned	3 4 5 6 7 8 9 10 11 12
				Non-Cush.	1 2 3 4 5 6 7 8 9 10 11 12
	2	⅝"	7/16-20	Cushioned	3 4 5 6 7 8 9 10 11 12 14 16 18 20 22 24 28 32 36
				Non-Cush.	1 2 3 4 5 6 7 8 9 10 11 12 14 16 18 20 22 24 28 32 36
	2½	⅝"	7/16-20	Cushioned	3 4 5 6 7 8 9 10 11 12 14 16 18 20 22 24 28 32 36
				Non-Cush.	1 2 3 4 5 6 7 8 9 10 11 12 14 16 18 20 22 24 28 32 36
	3¼	1"	¾-16	Cushioned	3 4 5 6 7 8 9 10 11 12 14 16 18 20 22 24 28 32 36
				Non-Cush.	1 2 3 4 5 6 7 8 9 10 11 12 14 16 18 20 22 24 28 32 36
	4	1"	¾-16	Cushioned	3 4 5 6 7 8 9 10 11 12 14 16 18 20 22 24 28 32 36
				Non-Cush.	1 2 3 4 5 6 7 8 9 10 11 12 14 16 18 20 22 24 28 32 36
	5	1"	¾-16	Cushioned	3 4 5 6 7 8 9 10 11 12 14 16 18 20 22 24 28 32 36
				Non-Cush.	1 2 3 4 5 6 7 8 9 10 11 12 14 16 18 20 22 24 28 32 36
	6	1⅜"	1-14	Cushioned	3 4 5 6 7 8 9 10 11 12 14 16 18 20 22 24 28 32 36
				Non-Cush.	1 2 3 4 5 6 7 8 9 10 11 12 14 16 18 20 22 24 28 32 36
	8	1⅜"	1-14	Cushioned	3 4 5 6 7 8 9 10 11 12 14 16 18 20 22 24 28 32 36
				Non-Cush.	1 2 3 4 5 6 7 8 9 10 11 12 14 16 18 20 22 24 28 32 36
HYDRAULIC	1½	⅝"	7/16-20	Cushioned	3 4 5 6 7 8 9 10 11 12
				Non-Cush.	1 2 3 4 5 6 7 8 9 10 11 12
	2	1"	¾-16	Cushioned	3 4 5 6 7 8 9 10 11 12 14 16 18 20 22 24 28 32 36
				Non-Cush.	1 2 3 4 5 6 7 8 9 10 11 12 14 16 18 20 22 24 28 32 36
	2½	1"	¾-16	Cushioned	3 4 5 6 7 8 9 10 11 12 14 16 18 20 22 24 28 32 36
				Non-Cush.	1 2 3 4 5 6 7 8 9 10 11 12 14 16 18 20 22 24 28 32 36
	3¼	1⅜"	1-14	Cushioned	3 4 5 6 7 8 9 10 11 12 14 16 18 20 22 24 28 32 36
				Non-Cush.	1 2 3 4 5 6 7 8 9 10 11 12 14 16 18 20 22 24 28 32 36
	4	1¾"	1¼-12	Cushioned	3 4 5 6 7 8 9 10 11 12 14 16 18 20 22 24 28 32 36
				Non-Cush.	1 2 3 4 5 6 7 8 9 10 11 12 14 16 18 20 22 24 28 32 36
	5	2"	1½-12	Cushioned	3 4 5 6 7 8 9 10 11 12 14 16 18 20 22 24 28 32 36
				Non-Cush.	1 2 3 4 5 6 7 8 9 10 11 12 14 16 18 20 22 24 28 32 36

(1) "A" and "H" Models 82, 84 and 86 with strokes over 18" require stop tubes.

Column strength requires larger diameter piston rods for the following:

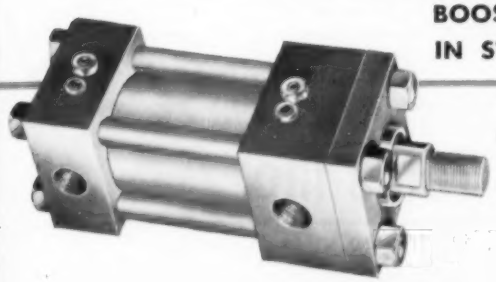
Air Cylinder Models A82, 84, and 86 with strokes inside area (1), when operated at 100 psi and over;

All hydraulic models with strokes inside area (2) and Models H82, 84, and 86 with strokes in area (4), when operated at 2000 psi and over;

Models H82, 84 and 86 with strokes inside area (3), when operated at 1000 psi and over.

Depending upon Trunnion Pin location, "A" and "H" Models 83 with standard diameter piston rods can have longer strokes than Models 82, 84 and 86.

See Miller File #251 for oversize piston rod and stop tube requirements.



BOOSTERS IN STOCK

Immediate Delivery on the following Miller 25 to 1 Ratio Boosters (80 psi air input produces 2000 psi hydraulic oil output): Model B4, 5" bore, 1" dia. ram, 6" and 12" strokes; Reciprocating Booster Model DA77-RBA8, 5" bore, 1" dia. ram, 6" stroke. Also Booster Tanks, 5" dia., 6" and 10" heights.

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Miller

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Flick-Reedy Corp
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AIR & HYDRAULIC CYLINDERS • BOOSTERS • ACCUMULATORS
COUNTERBALANCE CYLINDERS

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Patents Pending

Securely Held by Cap Screw. Quickly, easily removed by hand.

Accurate, Flush Fit — No Gap for Chips to Lodge or Pack

ORDINARY DESIGN — Secured by Shank and Socket

PIN-MOUNT DESIGN — Deeper flutes, over 60% greater space for chip disposal.

Improved 2-Piece Design Provides Over 60% MORE SPACE *for Chip Removal*

This new METCUT Pin-Mount Core Drill is a tool you can depend upon for faster cutting action and longer, trouble-free service because the new design provides up to 60% more space for chip removal. The replaceable cutters in either carbide or high speed, are accurately positioned and driven by means of four pins, and are quickly and easily removed by a simple Allen head cap screw. No drifts are required. Gap between tool body and cutter section is also eliminated. Chip flow is smooth. There is no lodging or packing. Since drifting is no longer required, you eliminate the danger of damaging tools and spindles, insuring greater accuracy and tool life.

Sizes Available from 3/4" to 5"

Of special importance is that now you can apply the advantages of the two-piece design to a wider variety of jobs. Small sizes as low as 3/4" are now available. Other sizes are provided in diameters up to 5". Furthermore, the new design will help you reduce setup costs because cutters can be easily removed without taking the body of the tool from the spindle. You replace cutters, which can be sharpened in sets, without readjusting spindles. This is of particular advantage where guide bushings and plates are used.

***Write* TODAY FOR COMPLETE DATA**

Get the full story on the advantages of the new METCUT Pin-Mount Design. Write for new brochure and complete specifications.

METCUT **Metal Cutting Tools Inc.**

325 S. WATER ST. • ROCKFORD, ILLINOIS

Manufacturers of High Quality End-Cutting Tools • Both Standards and Specials

HERE are TWO important advantages you get with Oakite Composition No. 98 in solvent spray washing:

1 *Effectively cleans parts between machining operations*

2 *Protects work against indoor rust*

OAKITE COMPOSITION No. 98—new emulsifiable solvent cleaner expressly designed for use in one and two-stage spray-washing equipment—safely removes light to moderate soils from all metals.

WHILE REMOVING THE SOIL, Oakite Composition No. 98 also gives machined parts a non-tacky film to protect them against indoor rust during temporary storage.

FOR REMOVING EXTRA HEAVY SOILS, Oakite Composition No. 98 may be used in combination with recommended Oakite alkaline detergent, using a two-stage pressure spray washer.

Read what enthusiastic users have to say about Oakite Composition No. 98. Then call your local Oakite Technical Service Representative for a demonstration of Oakite Composition No. 98. Or write for free descriptive booklet to Oakite Products, Inc., 26 Rector Street, New York 6, N. Y.

REMARKABLE RESULTS NOW OBTAINED BY ENTHUSIASTIC METAL FABRICATORS

Auto-maker washing blocks, cam shafts, tappets, wrist pins, transmission housings, fly wheels and other parts is delighted with the rust protection obtained.

Automotive plant turning out parts with highly finished surface reports use of Oakite Composition No. 98 not only cleans but also leaves a streak-free protective film so essential to quality control.

Metal fabricator finds that small precision steel parts are protected against rust for 3 to 4 weeks. The need for expensive fire prevention equipment—originally installed for use with low-flash rust-proofing oil—is eliminated.

Engine builder using Oakite Composition No. 98 in two-stage washer says not only are parts well cleaned but also protected against rust at unusually low cost.

Metal parts company washing parts by machine finds Oakite Composition No. 98 completely eliminates rusting in humid weather.

Manufacturing firm reports Oakite Composition No. 98 very economical. Parts come through clean and bright, no cloudy film—good rust protection.

Engine builder using Oakite Composition No. 98 after machining but prior to inspection and assembly expects five-day rust protection and gets it.

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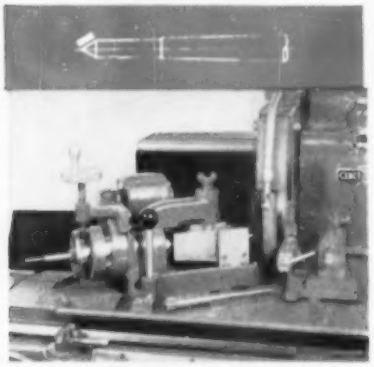
Here's the Point

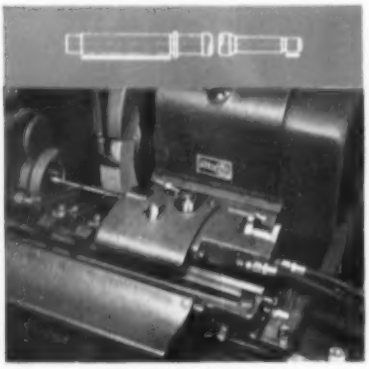
... your standard and special tooling high precision work, from the point on a textile machine part to small armature shafts, get the most economical grind on CINCINNATI® FILMATIC 4" Plain Hydraulic Grinders. May we tell you more? Catalog No. G-551-4 contains complete data; write for a copy.

CINCINNATI GRINDERS INCORPORATED
CINCINNATI 9, OHIO

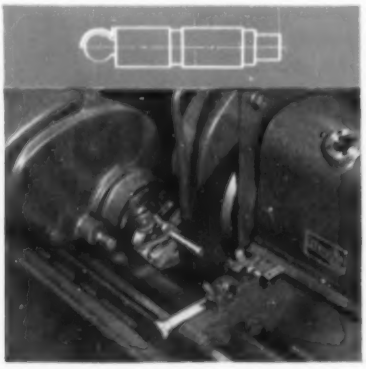
Master roller gages are ground to accuracies of 10 millionths in roundness and size on the CINCINNATI FILMATIC 4" Plain illustrated here. Surface finish within 2 micro-inches. Of course this machine is equipped with a number of extra features to enable it to produce ultra-precision work of this type. Compared to the previous machine and method, tolerances have been cut in half and production is about seven times greater.



Center angle and point radius are ground concentric with bearing diameters on textile machine parts. This Cincinnati engineered equipment illustrates how simply an unusual production job can be tooled up on a CINCINNATI FILMATIC 4" Plain Hydraulic Grinder. Conventional swivel table, headstock and footstock have been omitted and replaced by a special fixture.



Two diameters are precision ground on armature shafts in two setups, at the rate of 200 per hour per diameter. To reduce operator fatigue while maintaining a high rate of production, the CINCINNATI FILMATIC 4" Plain Hydraulic Grinder for this job is equipped with automatic infeed, hydraulic footstock and work cradles.



Ball end and shoulder are ground in one chucking on a CINCINNATI FILMATIC 4" Plain Hydraulic Grinder. Unique tooling for this job includes combination radius and angular truing attachment, and table with an angular bearing section for live spindle headstock featuring a lever operated draw-in collet attachment.

.048" eccentric diameter ground from the solid. The CINCINNATI FILMATIC 4" Plain Hydraulic Grinder at the left easily handles this heavy stock removal job. Equipment is practically standard with the exception of the work holding fixture and a special table type truing attachment.

CINCINNATI FILMATIC
4" PLAIN HYDRAULIC
GRINDING MACHINE
Catalog No. G-551-4
Brief Specs. in Sweets

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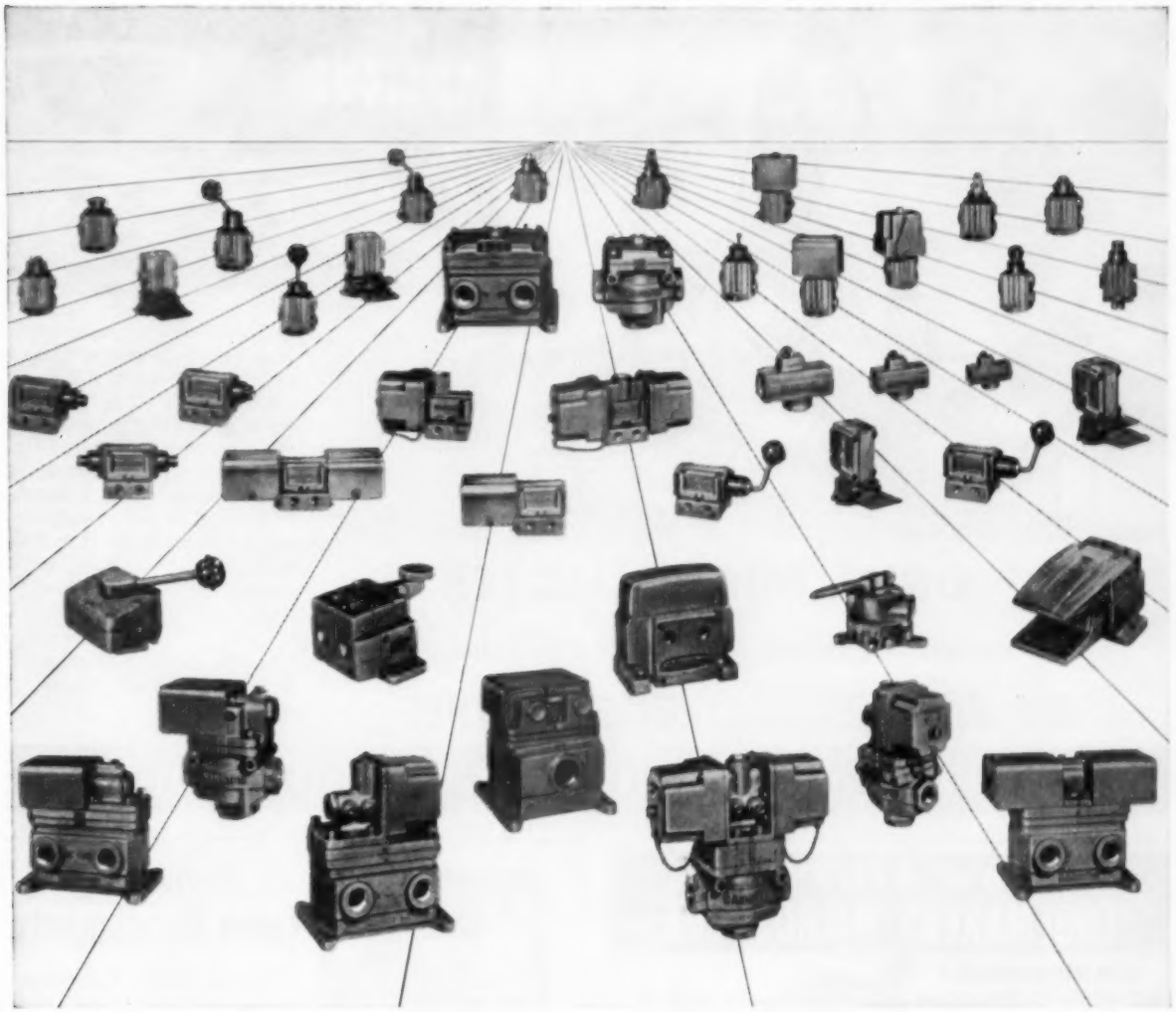
CENTERTYPE GRINDING MACHINES • CENTERLESS GRINDING MACHINES • ROLL GRINDING MACHINES • SURFACE • GRINDING MACHINES • CHUCKING GRINDERS
MICRO-CENTRIC GRINDING MACHINES • CENTERLESS LAPPING MACHINES



These valves like tough jobs

Discriminating engineers are finding that out. More and more of them are specifying Hannifin valves for every kind of directional air control—including the really tough jobs.

There are plenty of reasons why: Inspired simplicity of design. Fewer parts—and *those* easily and quickly replaceable. Ability to serve a wide range of applications with fewer valve models. And—above all—fast, smooth operation.

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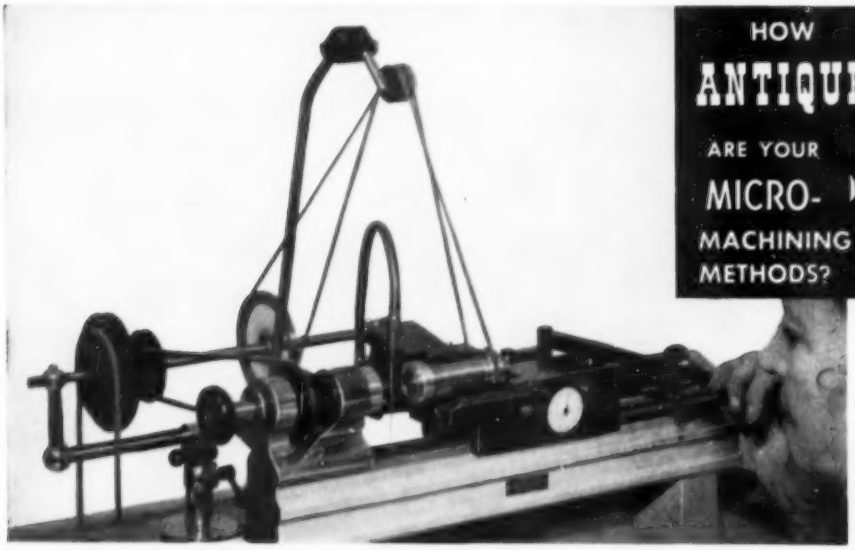
AIR CONTROL

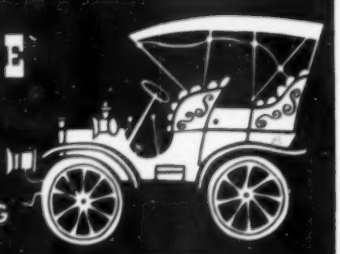
HANNIFIN

VALVES

For this complete catalog **showing all the Hannifin directional air control valves, write to Hannifin Corporation, 519 South Wolf Road, Des Plaines, Illinois.**



HOW **ANTIQUE** ARE YOUR MICRO-MACHINING METHODS?



DRILL MICRO-HOLES

DOWN TO .0016" with SPEED & ACCURACY

ON *LEVIN* ® INSTRUMENT LATHES

The Levin micro-drilling equipment shown here can be used with the smallest drills available. It is designed so that the drilling does not depend on the operator's sense of feel. The drill can be retracted for chip removal and returned to the drilling position without striking the bottom of the hole. While commercial drills can be had as small as .0016" this micro-drilling apparatus has successfully produced holes as small as .0006".

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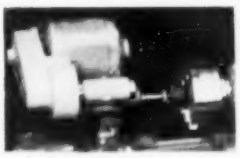

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Lathe Attachments

- *Increase Lathe Versatility*
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Factory Mutual Laboratories, Norwood, Mass.

Factory Mutual Laboratories test

SHELL IRUS FLUID 902

the low-cost, fire-resistant hydraulic fluid

Factory Mutual Laboratories, the well-known industrial testing authority, recently evaluated Shell Irus* Fluid 902.

The tests performed included:

1. **Flash Point**
2. **Autoignition**
3. **Flame Propagation**

The Shell Industrial Engineer can give you more information about these tests.

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In plant after plant, users find that Shell Irus Fluid 902 is comparable in fire resistance to much higher-priced hydraulic fluids.

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The once-familiar "Number Please" of the telephone operator is fast disappearing from the nation's consciousness...

...as America's swelling communities (5 million more households since 1950) make dial telephone systems a necessity.

Will your special tooling be able to answer the call?

More Americans with more spending money, demanding more and better products—that's the bright prospect for manufacturers.

Will you be able to answer the call for greater, more complex production at low cost? Not if you expect to build all your special tooling yourself.

Internal tooling facilities are fine for maintenance work, but they cannot match the contract tool and die industry in solving a variety of problems involving special dies, jigs, fixtures, gages, molds, other tools, and special machines. This industry of specialists has proved that it can do a better, faster, more economical job of designing and building special tools. That's why increasing numbers of manufacturers are placing more work with contract plants.

Manufacturing executives have found that contract plants can turn out top-quality work on schedule at a fair price. They get the benefits of an unmatched pool of creative skills and specialized equipment, plus supervision of their projects by high caliber owner-managers. They avoid heavy investments in skilled men, equipment and added floor space. Most important, they can focus on their main job—production.

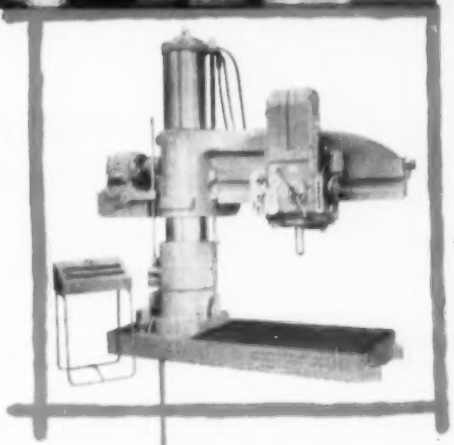
Convince yourself that it pays to go *outside* for special tooling. On your next job, call in an NTDMA plant. You will find a complete listing in the current Directory of NTDMA Member Plants and Services. May we send you a copy?

National Tool & Die Manufacturers Association
909 Public Square Building, Cleveland 13, Ohio

NATIONAL TOOL & DIE MANUFACTURERS ASSOCIATION — Tool & Die

IT PAYS TO GO OUTSIDE FOR SPECIAL TOOLING

Commodore John W. Anderson on the bridge of the luxury liner, UNITED STATES



Specialists do the job better: Smoother sailing guaranteed

You sail through troubled waters with greater confidence when there's a specialist at the helm. Carlton has been providing smoother drilling by concentrating on radial drill research, engineering and manufacturing since 1916. This close contact with industry's drilling requirements has produced a wide line of the most modern and up to date radial drills. Made in arm lengths from 3-ft. to 12-ft., column diameters from 9″ to 26″. Programming, pre-select, partial pre-select and manual speed-feed controls, plus special bases, tables and jigs available for additional productivity. The Carlton Machine Tool Co., Cincinnati 25, Ohio.

Carlton SPECIALISTS IN RADIAL DRILLS

Graph-Mo® dies cut downtime 50% on deep draw for round vacuum cleaner!

ENGINEERS at The Hoover Company had a tough problem in getting that round vacuum cleaner shape in the new Constellation. The two circular dies that form the hemispheres often galled, picking up bits of the steel being formed. This scored the dies, marred the finished parts. Production had to be shut down while the dies were repolished. And extra polishing of the hemispheres ran up costs still more.

After studying the problem, Timken Company metallurgists recommended dies made from Graph-Mo®—a special tool steel developed by the Timken Company. Results were outstanding. The new Graph-Mo dies cut downtime 50%. The combination of free graphite particles and diamond hard carbides in its structure make it outwear other tool steels 3 to 1. Production rolled smoothly and refinishing time was cut.

Graph-Mo machines 30% easier than conventional tool steels. And its uniform response to heat treatment eliminates distortion—saves time and money in lots of tough jobs.

Graph-Mo is one of four graphitic tool steels developed by the Timken Company. If you would like more information about their uses in dies, punches, gages and machine parts, send for the new Timken Graphitic Steel Book. The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, Ohio. Cable address: "TIMROSCO".

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TRADE-MARK REG. U.S. PAT. OFF.

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. . . . Yes, but a mighty important part of any Twist Drill. That's where the first contact comes, that's where hole size, roundness and surface smoothness are made or lost. That, in short, is the heart of the drilling operation.

GTD-AMPCO Drills are made with special attention to point accuracy, but behind the point you'll find that GTD-AMPCO Drills are exceptional for concentricity of flutes and lands, regularity of margins, polished flutes for better chip slippage, *and* in sizes over 1 inch the exclusive GTD-Ampco feature . . . they're HAMMER-FORGED for extra toughness and longer wear life.

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GREENFIELD TAP AND DIE CORPORATION

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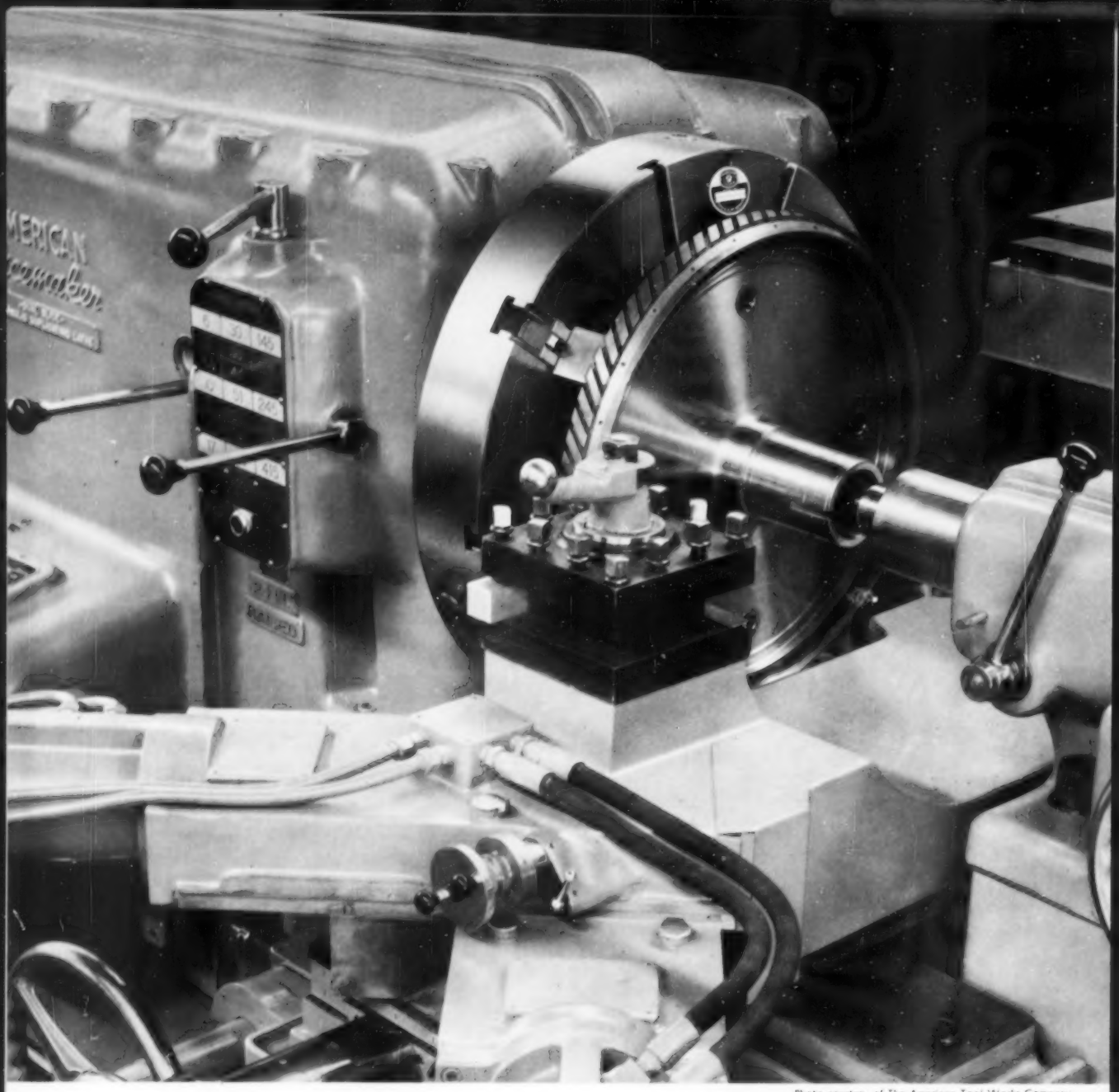

Photo courtesy of The American Tool Works Company

THE LATHE — *American Pacemaker 25" Style "G" Hydraulic Duplicating Lathe*

THE OPERATION — *Machining a jet engine compressor wheel*

THE CHUCK — *Horton, of course*

HORTON CHUCK DIVISION
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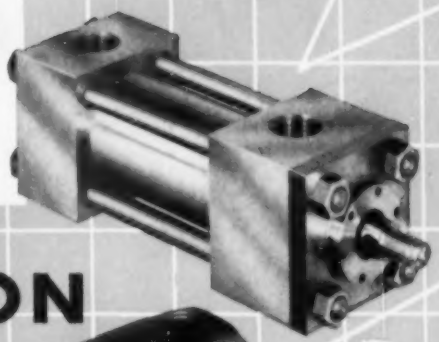

O-M Series TH
Hydraulic 2000 PSI
Meets JIC Standards

O-M Tie-Rodless
150 PSI Air
Up to 1500 PSI Oil
Meets JIC Standards

Look for the big O-M in Aut-OM-ation! Today's high speed Automation Program demands high quality, dependable Air and Hydraulic Cylinders — Cylinders able to maintain today's pace with a minimum of attention. This is why you'll find more and more O-M Cylinders right in the middle of Aut-OM-ation.

O-M Tie-Rodless Cylinders (Round Line)—150 PSI Air—Up to 1500 PSI Oil—Compact in design "To Fit Where Others Won't"—with the lowest coefficient of friction and easily serviced when necessary. Versatile mounting and port orientation.

O-M Tie-Rod Cylinders (Series "TH")—2000 PSI Oil—Equipped with removable rod gland cartridge for easy maintenance—The modern improved version of the square, tie-rod cylinder, designed to give the best in performance.

All cylinders available in full range of sizes (1½" through 8" bores) with standard and heavy-duty piston rods.

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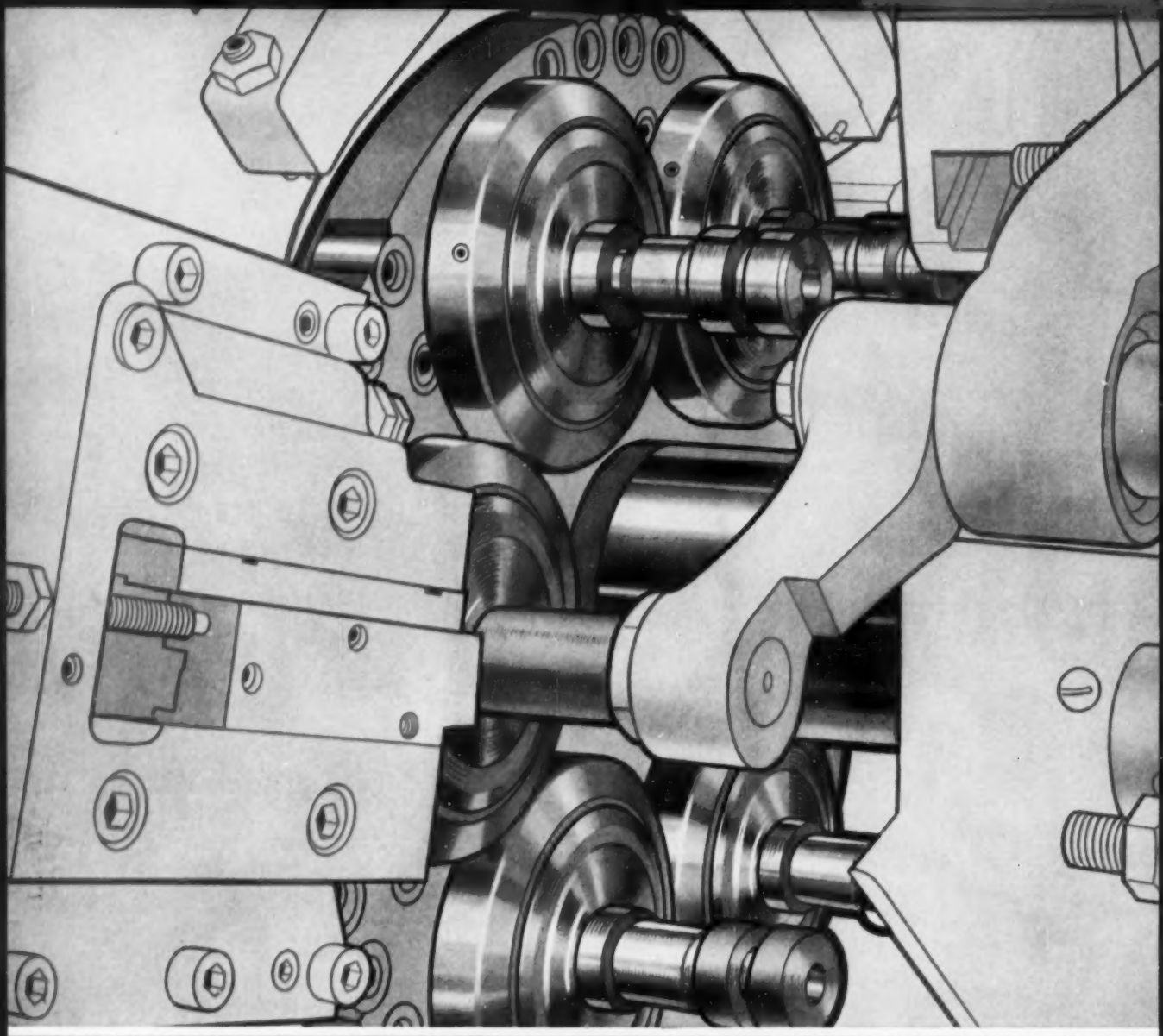
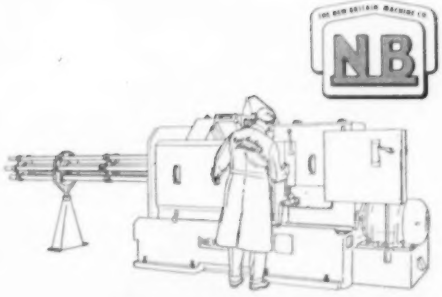


get more bar work done with the widest range of spindle speeds

The New Britain Model 62, 2¼" automatic bar machine illustrated, has a spindle speed range of 117-3,000 R.P.M. No other multiple spindle bar machine in its capacity offers as wide a range of spindle speeds combined with New Britain standards of accuracy. Before you decide on *any* bar machine, be sure to check on *new* developments in New Britains. The New Britain Machine Company, New Britain-Gridley Machine Division, New Britain, Connecticut.



Automatic Bar Machine

only

Heller *Spiral cut*

HALF ROUND

FILES

ROLLING ACTION IS BUILT IN! With Heller SPIRAL-CUT Half Round Files stocked in tool cribs, even "green hands" can be put to work filing holes and concave surfaces. That's because no skilled twisting is required to prevent grooving, as with straight-row cut half rounds.

20% MORE CUTTING POWER! Heller's exclusive SPIRAL-CUT puts 20% more teeth to work than any other file of comparable size. So, production is speeded up.

INDENTED OVER-CUT TRIPLES LIFE! Heller's exclusive over-cutting process broadens the edges of up-cut teeth as much as three times . . . makes this a smoother cutting file . . . multiplies file life by three.

PATENTED "WAVY TEETH" ON FLAT SIDE! This unique Heller combination of coarse, fine and very fine teeth gives faster, smoother cutting than any other file of equal size and coarseness.

COMPARE! Heller Nucut SPIRAL-CUT Half Round Files, tested against all comers, invariably win out . . . and lead to better filing at lower costs.

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Heller *"So Tempered"* Tools

Heller Tool Co.

HELLER TOOL CO. SINCE 1879

America's Oldest File Manufacturer

NEWCOMERSTOWN, OHIO

Subsidiary of Simonds Saw and Steel Co.

R-J Four-Station All-Mechanical Special-Purpose Drilling and Countersinking machine. Drills and countersinks 2 holes in frame pieces for auto body manufacturer. Rated at 1200 pieces per hour.

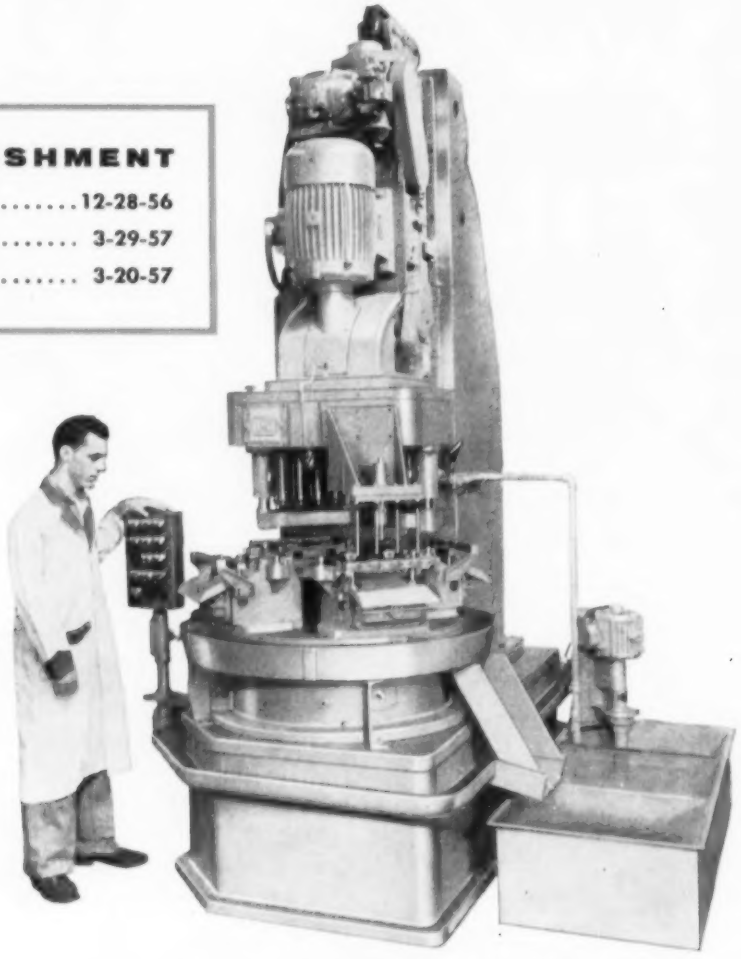
R-J

CASE HISTORY
MACHINE NO. 1241

REHNBERG-JACOBSON

ACCOMPLISHMENT

Order Placed.....12-28-56
Required Delivery..... 3-29-57
Machine Shipped..... 3-20-57



ANOTHER "ON TIME" ARRIVAL

WANTED: In a hurry, a high-capacity production machine for performing a couple of standard machining operations.

PREFERRED: For a variety of reasons, an all-mechanical machine.

RECEIVED: In 90 days, the machine shown above. R-J was able to deliver rapidly because of experienced teamwork and because the all-mechanical Power Feed Unit was in stock, parts for the standard Index Table were in stock, and the column is a standard R-J design. The base was special. The drill head and the work-holding, clamping, and unloading fixtures had to be designed and manufactured. The operator simply loads four pieces into each fixture, all other functions of the machine are automatic.

REHNBERG-JACOBSON MANUFACTURING CO.
2135 KISHWAUKEE ST., ROCKFORD, ILLINOIS
DESIGNING ENGINEERS, MANUFACTURERS,
AND PRODUCTION CONSULTANTS

Saves $82,507 Per Year

with TOCCO Induction Hardening*

Gears, shafts, pins, wheels, tubes and bars—almost any size or shape of part—or any metal, too—is adaptable to TOCCO hardening, brazing, annealing or heating for forging.

Production Up—Engineers at the Milwaukee Works of International Harvester Company have adopted TOCCO for hardening final drive gears for famous International Harvester farm tractors. TOCCO increases production on the gear shown here from 14 to 35 per hour, 250% faster than conventional heating method, reduces job from a 3 shift to 2 shift operation, even with increased production schedule. Heating time is 35 seconds; oil quench, 60 seconds.

Costs Down—TOCCO cuts cost—saves $82,507 per year on application shown above. TOCCO makes possible use of C-1050 A.R.R. steel instead of expensive A-8645-H alloy steel previously required. TOCCO also eliminates shot-blast, formerly needed to remove scale, and extra machining operations that used to be necessary to compensate for distortion.

Gear shown is 18½" O.D., width of face is 2", weight 34 pounds, 73 teeth. Hardness obtained is 55-66 R.C., using 140 K.W. of 10,000 cycle power.

Our Engineers can probably find applications in your plant where TOCCO can increase output and reduce unit costs.

TOCCO

JUST PUSH A BUTTON

THE OHIO CRANKSHAFT COMPANY

Mail Coupon Today—**NEW FREE Bulletin**

The Ohio Crankshaft Co. • Dept. G-5, Cleveland 5, Ohio

Please send copy of "Typical Results of TOCCO Induction Hardening and Heat Treating".

Name_____

Position_____

Company_____

Address_____

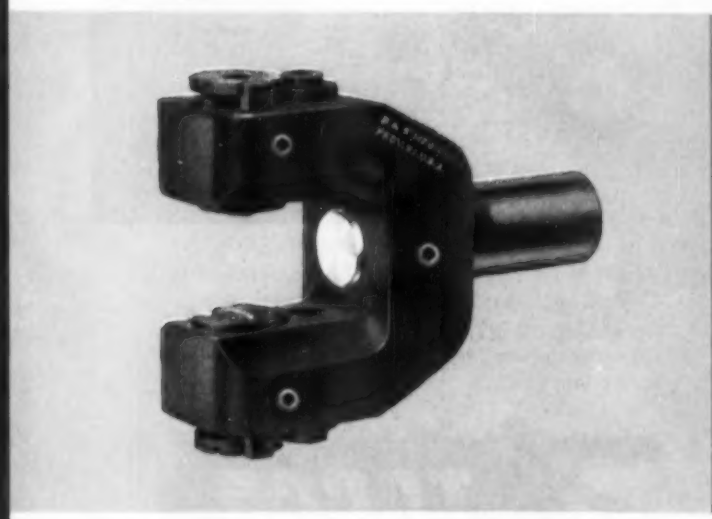
City_____ Zone____ State_____

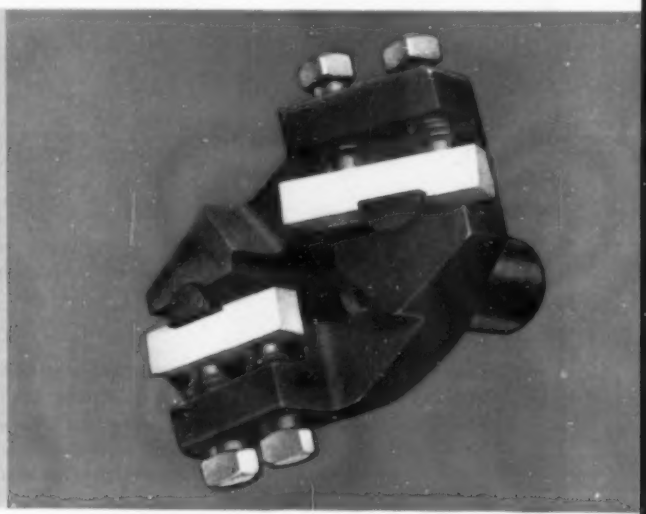
NEW BROWN & SHARPE SCREW MACHINE TOOLS

...designed to give you peak performance on new B&S No. 2 automatics!*

Here are new screw machine tools that fully match the high efficiency of the new B&S No. 2 automatics. They have the capacity, the quick-setting features, the accuracy and the ruggedness that you need for faster production...consistently closer tolerances...on stock ranging from free machining materials to high alloy steels.

Send for complete details today, and ask for the illustrated brochure on the new tools, Form No. S25. Or better yet, plan to visit Brown & Sharpe's new Precision Center in Providence, where you can see for yourself how new B&S No. 2 Automatic Screw Machines, equipped with B&S tools give you *up to 80% faster production!* Brown & Sharpe Mfg. Co., Providence, R. I.



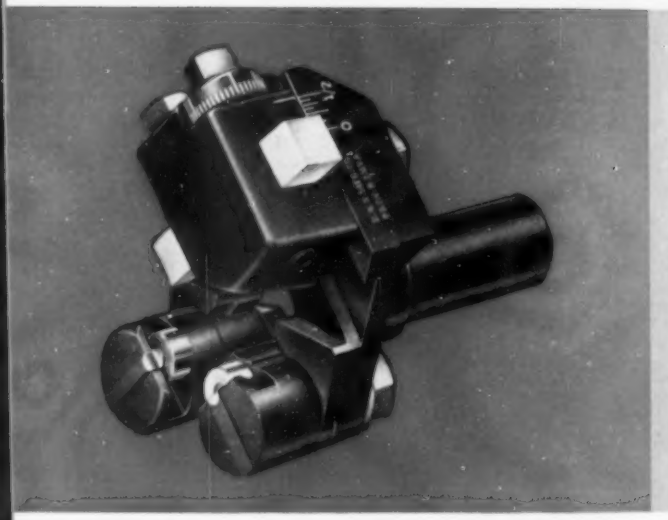


B&S ADJUSTABLE KNURL HOLDER, No. 185 — Requires only one wrench for all adjustments. Knurling length has been increased to 1-3/8" at turning diameters to 1-1/2" . . . 2-1/4" at diameters of 3/16" to 15/16". Knurls are mounted in adjustable swiveling holders, for producing straight, spiral or diamond knurling using straight knurls. Furnished with long-wearing carbide pins and high-speed steel knurls.

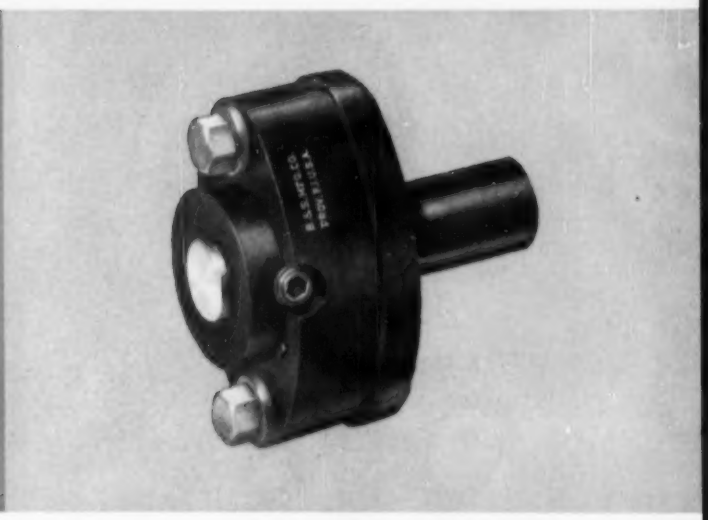
B&S BALANCE TURNING TOOLS, Nos. 60, 61 — Offer increased turning capacity of 1/4" to 1-1/4" diameter for a length of 2". Tools are free-cutting and adjustable to a wide range of sizes...feature improved ruggedness for greater strength and rigidity. One set of easy-to-remove blades covers all sizes of work. One blade can remove one-half the chip while opposite blade is set to size, or both blades can be set to size.

*AVAILABLE TO IMPROVE PRODUCTION ON MANY OTHER MACHINES

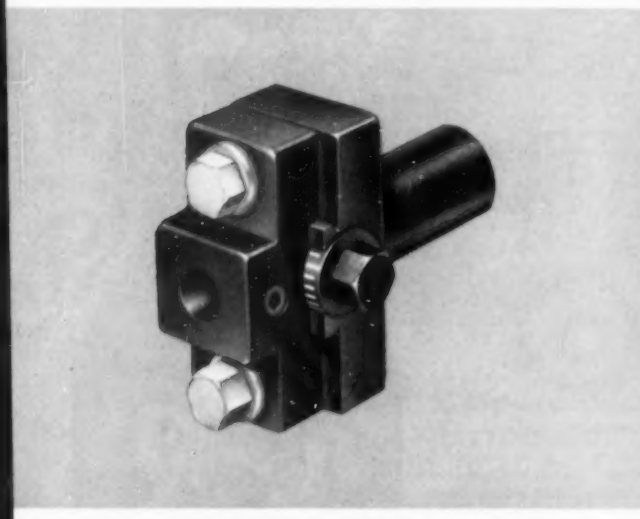
These advanced-design tools in various sizes insure quicker setups, closer tolerances and greater production on all Brown & Sharpe screw machines...on turret lathes and many other machines. Brown & Sharpe engineers will be glad to help you apply the new tools to your own operation.



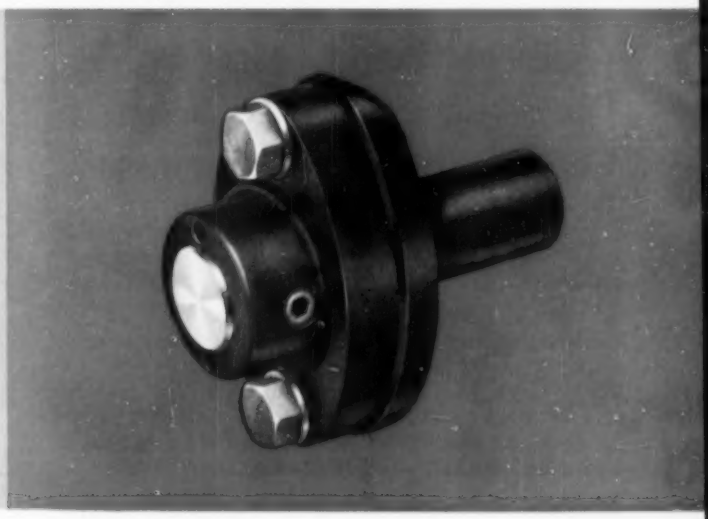
B&S ROLLER BACK BOX TOOLS, Nos. 51, 52, 53, 54 — Right- and Left-Hand. Offer lower minimum and higher maximum turning capacities (3/16"-1-1/4") . . . quick and accurate setups. Feature one scale for rough setting to diameter plus a graduated adjusting screw for final precision setting. These box tools produce straight, accurate turning with a good burnished finish, without preliminary roughing cuts. Both blade and back rests are adjustable for work of any diameter within tool capacity.



B&S ADJUSTABLE TAP HOLDERS, Nos. 100, 105 — Simplify setup and maintain accuracy. The holder is adjustable to allow quick centering of the tap with the hole. Then it is securely clamped in position. Once the tap is accurately aligned, holder keeps it parallel with axis of work. Available in a non-releasing type, for use on automatics; and in the releasing type, usually used on hand screw machines, which has a clutch mechanism that releases the holder without shock when tap reaches desired depth.



BORING TOOL HOLDER, No. 111 — Ideal holder for the boring tools that are being used to produce straighter, more concentric holes than drill and reamer combinations. Graduated screw adjustment on this tool allows fast setups...and because the slide moves straight across in a horizontal plane, there is no change in vertical centering or cutting clearance when size of hole is changed. Total slide adjustment is 5/16".

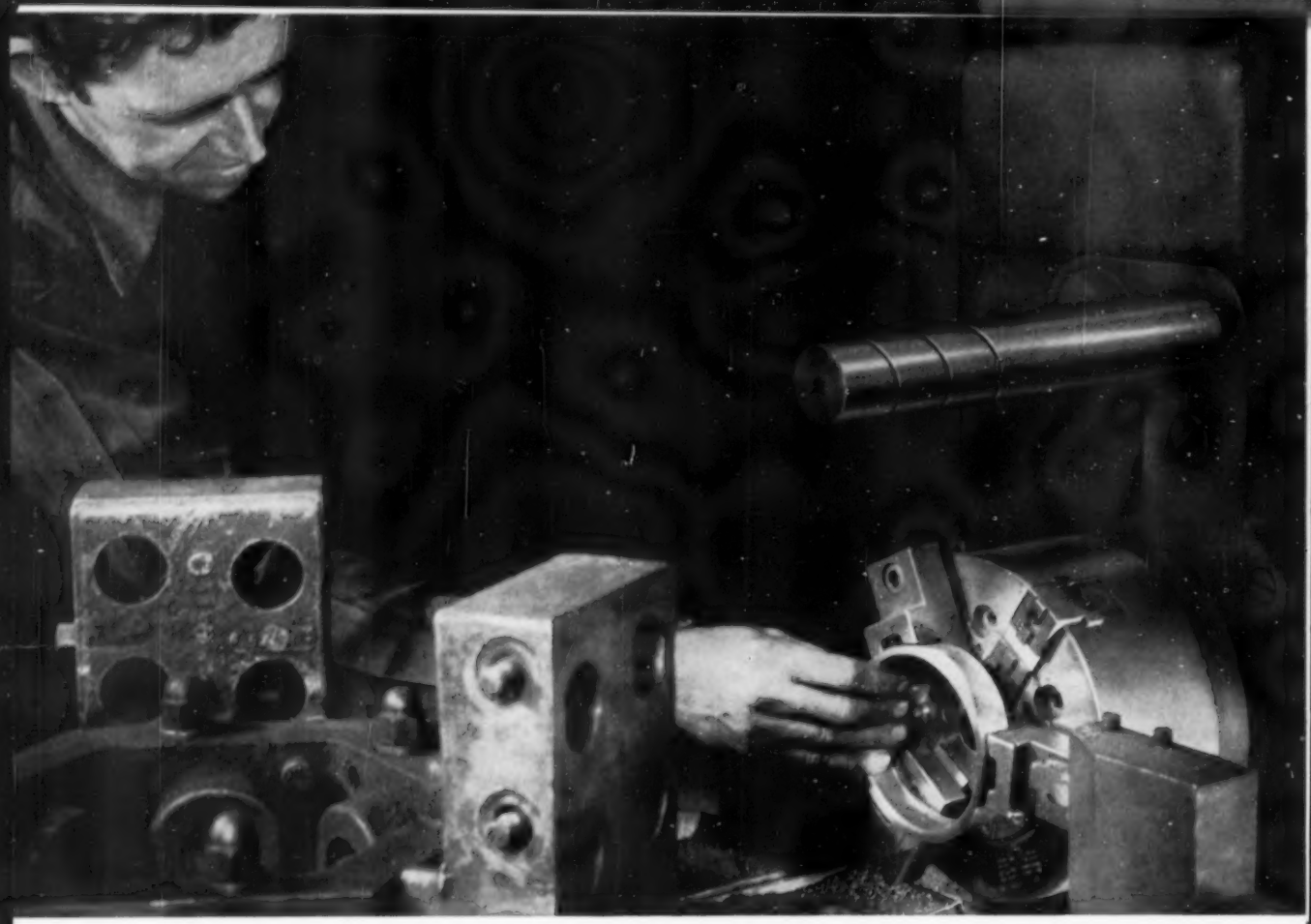


B&S FLOATING REAMER HOLDER, No. 67 — Shortens setup time considerably by requiring only one adjustment. The holder floats freely in a vertical plane ...letting the reamer align itself with the hole, while holding the reamer parallel to the hole at all times. Eliminates time-consuming fine adjustment. The float of the tool is mechanically centered to prevent bell-mouthed or egg-shaped holes.

BUY THROUGH YOUR LOCAL DISTRIBUTOR

Brown & Sharpe B·S

MILLING, GRINDING AND SCREW MACHINES • CUTTERS • MACHINE TOOL ACCESSORIES • PRECISION TOOLS AND GAGES • GEAR, VANE AND CENTRIFUGAL PUMPS

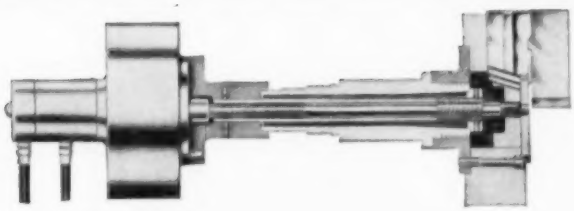


Skinner Power Chucks will chalk up immediate savings on your production machines!

Cost-per-piece savings add up to a really important figure for production boring done on this Skinner-equipped Potter & Johnston 3-U Speed-flex automatic chucker. You can give your plant the same kind of savings, too.

Look at that Skinner Power Chuck. It grips and releases instantly — compressed air does the hard work, and does it fast. You can see how much longer it would take to chuck these pieces by hand — time that pushes up costs. Elimination of hand wrenching cuts fatigue way down, too — operators like that.

You'll put your plant in a much better profit position when you equip your production machines with Skinner Power Chucks, because you'll greatly reduce your most important cost factor: overall machining time. Write for Catalog 68P, with complete specifications, applications, and installation instructions. Write Dept. 185.

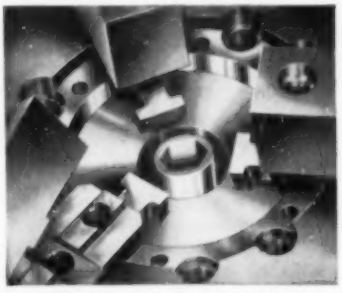


For small lathes, too!

On small lathes, like South Bend, Hardinge, Sheldon, Logan, or Atlas, used on production runs, the Skinner "Junior" Power Chucking Unit will cut costs by saving *time*. Ask for special Bulletin JP67.

Simple, dependable operation.

Skinner's proved-in-service wedge principle guarantees positive, trouble-free operation. Jaws are closed or opened instantly by an actuating wedge, operated by a double-acting air cylinder.



Skinner Power Chucks are available through leading Industrial Distributors everywhere.

SKINNER CHUCKS

THE SKINNER CHUCK COMPANY

ESTABLISHED 1887

NEW BRITAIN, CONNECTICUT

HACKSAWS

NOW COLOR-IDENTIFIED FOR EFFICIENT BLADE SELECTION

Color-identified to help you select the right blade for any job . . . production-proved for better cutting performance, longer blade life. These new Starrett faster-cutting, longer-lasting hacksaws are now available through your Industrial Supply Distributor in all power and hand sizes and types.

Starrett

SINCE 1880
WORLD'S GREATEST TOOLMAKERS

BAND SAWS

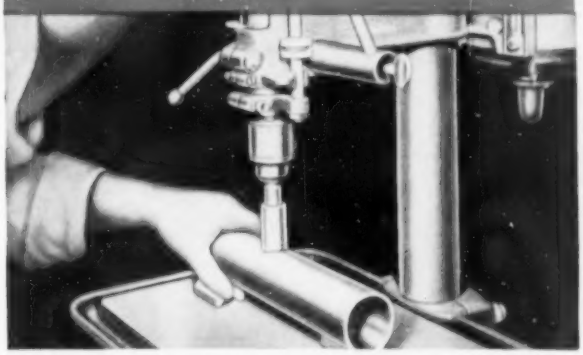
PRODUCTION-PROVED TO CUT FASTER, LAST LONGER

Starrett-engineered blade construction means uniform cutting action, less chance of blade breakage. Starrett makes regular, "skip-tooth," spring temper and friction cutting types for all metal cutting applications as well as regular and "skip-tooth" types for cutting wood, plastics, fibre and non-ferrous metals. Furnished in coils or cut to length and welded, ready for use.

Starrett

SINCE 1880
WORLD'S GREATEST TOOLMAKERS

HOLE SAWS



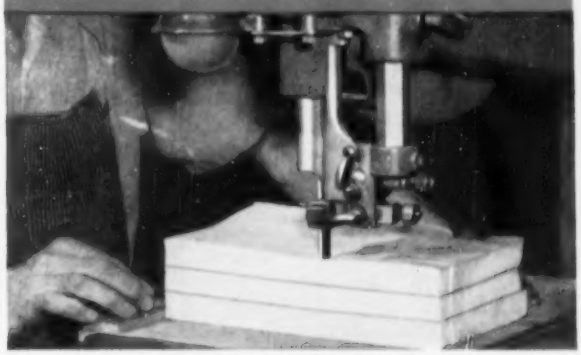
DOUBLE-WELDED AND SHATTERPROOF SIZES FROM 9/16" TO 6"

These new Starrett high speed welded edge hole saws are designed for long, hard, safe use without shattering. Use them to cut clean, round holes in metals, plastics, woods . . . any machinable material up to 1 1/8" thick. Interchangeable arbors hold a wide range of saw sizes. Four different arbors available to fit power tools, lathes, drill presses.

Starrett

SINCE 1880
WORLD'S GREATEST TOOLMAKERS

BAND KNIVES



FOR SOFT OR FIBROUS MATERIALS . . . 3 TYPES, ALL SIZES

Use Starrett FAST-KUT Band Knives for clean, fast, efficient cutting of all soft or fibrous materials. No chips, dust or waste. Ideal for stack cutting, trimming, slicing, cut-apart operations, etc. Available in a complete range of sizes in straight-edge, scallop-edge, or wavy-edge types — single or double bevel.

NEW SAW CATALOG

Describes the complete line of Starrett hacksaws, hole saws, band saws and band knives. Write for your free copy. Address Dept. E,

THE L. S. STARRETT COMPANY, ATHOL, MASSACHUSETTS, U. S. A.

After thorough research, development and tests . . .

The very first in its field!

NewMet*

by NEWCOMER

Neither a ceramic... nor a tungsten carbide... but an all-new high-velocity metallic cutting material

△ □ ○ NewMet by Newcomer has opened a new field of high velocity cutting in metal-working. A product of Newcomer research and development over the past ten years, this new material is capable of cutting performances beyond the capacities of present machines. Its extreme hardness (Rockwell "A" 95), combined with a comparatively high strength, gives NewMet the ability to perform superbly at both normal carbide cutting speeds or at speeds within the range of ceramic-type cutting tools.

Typical NewMet* PERFORMANCE DATA

1 Turning Low Carbon Steel			2 Turning Medium Carbon Steel			3 Turning Stainless Steel (Magnetic Type)		
SPEED	DEPTH OF CUT	FEED	SPEED	DEPTH OF CUT	FEED	SPEED	DEPTH OF CUT	FEED
1000 to 1500 SFPM	.001" to .090"	.001" to .012"	900 to 1200 SFPM	.001" to .090"	.001" to .012"	800 to 1500 SFPM	Up to .100"	.007" to .010"

Economize now with high-velocity cutting . . . use *"Years Ahead"*

NewMet* by NEWCOMER

NewMet is available in "Throway" triangular, square and round inserts, and solid cylinders. Call your nearest Newcomer representative for complete data, or contact

*Pat. App. for.

NEWCOMER PRODUCTS, Inc.
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Sales Offices are located in principal cities

Staples
CARBIDE TOOLS

Twenty years of Carbide Tool making

Craftsmen at Staples of Cincinnati have been making finer carbide tools for twenty years and more. Behind each tool coming from the ultra-modern Staples factory is a long standing tradition of superior workmanship—your assurance that a Staples tool will cut production costs.

THE Staples TOOL COMPANY, 2352 Glendale-Milford Road, Cincinnati 15, Ohio

star performer

...and among high speed steels

REX is the leader

Crucible REX® high speed steel has been the winner in shop tests for more than fifty years. *And now REX is even better than ever!* For Crucible research and experience has led to improved manufacturing techniques that mean higher quality – greater uniformity.

Prove the superiority of REX for yourself – on your next job. Check it for size, structure, response to heat treatment, all-around tool performance. Then you'll know why REX has always been the *standard by which other high speed steels are compared.*

REX is immediately available at all of Crucible's convenient warehouses – or through prompt mill delivery. For a list of available data on REX and other Crucible *special steels,* write for a free copy of the "Crucible Publication Catalog". *Crucible Steel Company of America, The Oliver Building, Mellon Square, Pittsburgh 22, Pa.*

CRUCIBLE first name in special purpose steels

Crucible Steel Company of America

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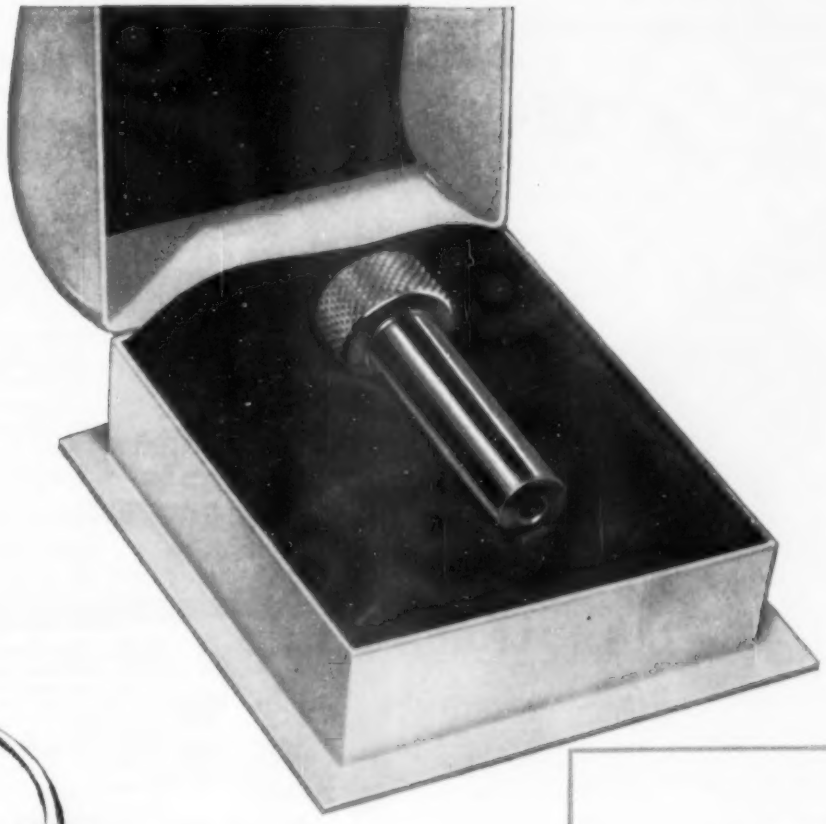

diamond-like quality and hardness!

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DELUXE MODEL SOLID TUNGSTEN CARBIDE DRILL JIG BUSHING

- Wears 50 times longer
- Made to A.S.A. standard tolerances or special requirements
- Made in all types of A.S.A. standards
- Manufactured with full drill bearing surface
- Reduces down time to an absolute minimum
- Non-corrosive and rust-resistant
- Many sizes in stock

Write your distributor or Acme for information and prices on tungsten carbide, micro and standard drill jig bushings.

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FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-5-285

"SHEAR SEAL" 4-WAY VALVES, 0 TO 250 P.S.I. AIR

$18.50 List Price*

*$18.50 is the list price for the ¼" port size and $19.50 for the ⅜" less usual quantity discounts.

NO MORE AIR VALVE TROUBLES FROM DIRT OR CORROSION

(AND WITHOUT COSTLY FILTERS AND OILERS)

Important Savings	Low initial cost. Need no oilers and filters (time and materials savings).	All components are corrosion resistant.
Low Maintenance	Sealing qualities do not diminish with long, continued use.	Wear compensating "Shear-Seal" design.
Long Service Life	No production delays. Maintenance (rarely needed), without disturbing plumbing.	Lapped metal to metal sealing members.
Not Critical to Dirt	No scoring or binding. (As with spool or poppet designs.)	Flow is through "Shear-Seals." Sealing surfaces remain in constant intimate contact.
No Creeping Cylinders	Leakproof closure. (No internal port to port leakage.)	Maintained through lapping action of each operation.

Ask for bulletin A-5.

Foot operated models with or without spring return to reverse or to center are $24.50 list for the ¼" and $25.50 for the ⅜" valve less quantity discounts.

BARKSDALE VALVES

5125 Alcoa Avenue, Los Angeles 58, California

USE READER SERVICE CARD; INDICATE A-5-286-1

IF YOU SIT HIGH, YOU'LL "SIT HANDSOME" IN A Cramer HI-MODEL CHAIR

COMPLETELY ADJUSTABLE ...fits YOUR build just right

• Scientifically planned in each detail, the Cramer Hi-Model has thick shaped-foam cushions and independently-adjustable seat, back and footring to support you comfortably and aid you in your work. Removable covers available in a wide choice of colors and fabrics.

OVER 100,000 CRAMER HI-MODEL CHAIRS NOW IN USE ALL AROUND THE WORLD!

Cramer Hi-Model 4D-22T, pictured, with forward-tilt seat; others available, all low-gravity balanced for use ON CASTERS if desired.

LIKE MORE INFORMATION?

Cramer Posture Chair Co. Inc., TE-57
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Please send complete facts on Cramer Hi-Model chairs for working architects and engineers.

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Firm_____
Address_____

USE READER SERVICE CARD; INDICATE A-5-286-2

Avoid MISALIGNMENT TROUBLES!

On tapping and reaming jobs, a sure-fire way of avoiding misalignment troubles is to use Ziegler Floating Tool Holders in making your set-ups.

The reason for this is that the Ziegler automatically corrects errors in alignment, even though they amount to as much as 1/32" on the radius (1/16" on the diameter).

Play safe and use a Ziegler.

PROMPT DELIVERY

W. M. ZIEGLER TOOL COMPANY
13574 AUBURN DETROIT 23, MICH.

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Ziegler ROLLER DRIVE FLOATING HOLDER for Taps and Reamers...

USE READER SERVICE CARD; INDICATE A-5-286-3

Any Welding Job AC or DC can be handled with one machine

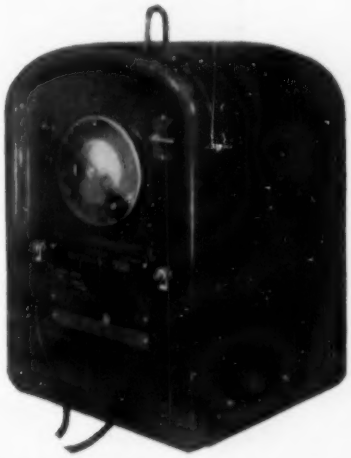
That's why it pays to standardize on

LINCOLN IDEALARC

This job required DC welding . . . The next job needed AC.

WITH Lincoln Idealarcs you can schedule any welding job on any machine. You can take any machine to any job. You can do these things because every Idealarc can give you both AC and DC welding current . . . whichever is best for the particular job.

Hadn't you better standardize on Idealarc? Write for Bulletin SB-1343 and SB-1364 for facts.



Idealarc AC/DC Welder available in 180, 250, 300, 400, 500 amp. sizes.

THE LINCOLN ELECTRIC COMPANY

Dept. 5015, Cleveland 17, Ohio

The World's Largest Manufacturer of Arc Welding Equipment

When one welder IDEALARC Has both AC and DC Yet costs less to buy and operate

WHY use anything but IDEALARC

Tool Steel Clinic on Two Feet

YOUR MILNE SALES-ENGINEER

Your local Milne man is a tool steel specialist, trained to help you solve your tool material problems. He's an expert in tool steel characteristics and applications who can help specify exactly the right steel for the job.

He represents MILNE, America's Leading Tool Steel Specialists. That means he has a tremendous range of grades, sizes, shapes and finishes of tool steel to draw upon, including many unusual ones that are hard to find elsewhere.

Milne has grown up in the tool steel business. Its CONCENTRATION and SPECIALIZATION on this field is reflected in the variety of its warehouse stocks and the special knowledge in the minds of its representatives.

If tool steel is involved, call in a specialist ... call MILNE.

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NEW TOOL
STEEL SELECTOR

Includes several newly developed Milne tool steels

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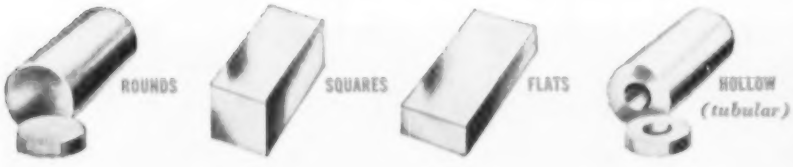
wide range of sizes and grades in

WATER HARDENING • NON-DEFORMING • SHOCK-RESISTING HOT-WORK & HIGH SPEED TOOL STEELS

Full length Kolorkoted for permanent identification



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Complete Line of Tool Steels A Wide Range of Sizes and Grades

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Established 1887 — Incorporated 1957
General Offices: 67 W. 44th St., N. Y. 36, N. Y.
America's Leading Tool Steel Specialists
Complete Line of Tool Steels — HOLLOW and SOLID

AM-35

a precision job well done....

by BATH

PROBLEM:

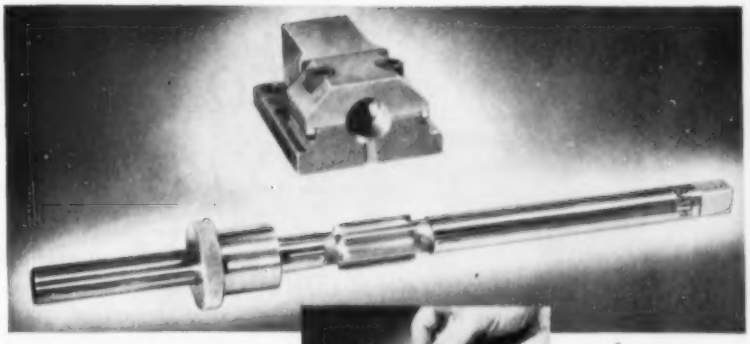
To produce a 1"-32 NEF left hand thread 1½" long to the extremely close pitch diameter tolerance of ±.00115" — thus greatly increasing the precision of the work.

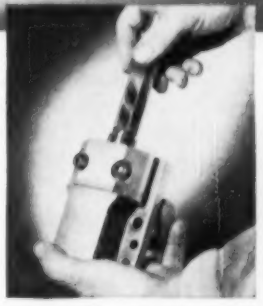
SOLUTION:

A 16" overall 1"-32 NEF pilot tap was manufactured by BATH to thread to the required tolerance.

•

This special 16" Bath tap, threads the feed nut (shown right), which is part of a truing device that controls the grinding quality of precision Internal Grinding machines manufactured by The Heald Machine Co., Worcester, Mass. — a subsidiary of the Cincinnati Milling Machine Co.



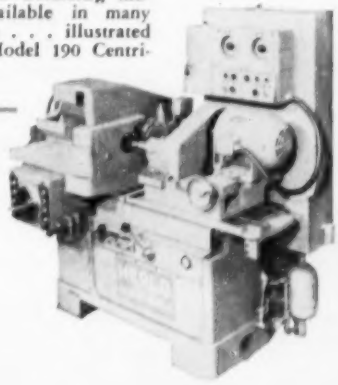


Threads are checked for accuracy with a Bath plug thread gage.

Here's an example of how the cooperative efforts of Bath and Heald engineers succeeded in solving a difficult production problem.

The same service is available to you — as a plus feature that may well save you time and money. Your inquiry will bring full details about Bath taps and gages.

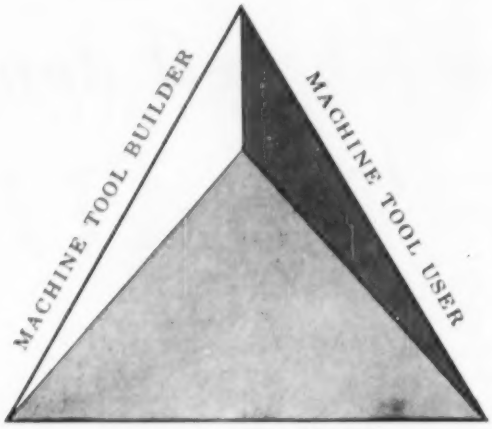
Heald Internal Grinding machines are available in many types and sizes . . . illustrated below is the Model 190 Centri-Matic.



JOHN BATH & CO., Inc.

28 Grafton St., Worcester, Mass.

CYLINDRICAL AND THREAD GAGES · GROUND THREAD TAPS · INTERNAL MICROMETERS



THE AUTOMATION PYRAMID

The very essence of automatic metalworking and part transfer is CONTROL. And, for greatest effectiveness, control must be an integral part of the basic design of the system—not a belated afterthought.

Thus, the Automation Pyramid rises from a base that incorporates the concurrent efforts of the user, the machine tool builder and the "autometrologist"*. Each contributes essential knowledge and experience that is exclusively his.

The user alone can define the task by specifying the design, quality and production rate of the product to be made.

The machine tool builder defines the sequences in metal removal, the speeds and feeds. The "autometrologist" is responsible for the choice and combination of sensing, measuring, prediction, feedback, machine control and assembly operations.

Before embarking on your automated project, take advantage of Sheffield's extensive experience in "Autometrology". It will save much valuable time and reduce operating cost. Write to the Sheffield Corporation, Dayton 1, Ohio, U.S.A., Dept. 19.

**AUTOMETROLOGY—The science of combining machining, motion or memory with automatic measuring.*

7709

Northwestern TOGGLE-SHOE CLAMPS

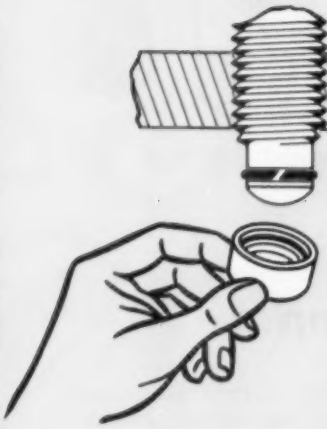
THREE NEW SOCKET TYPES! KNURLED SHAFT • KNURLED HEAD • HAND KNOB

ALL TYPES ARE INTERCHANGEABLE WITH *"SNAP ON-SNAP OFF"* ROUND OR V-PADS

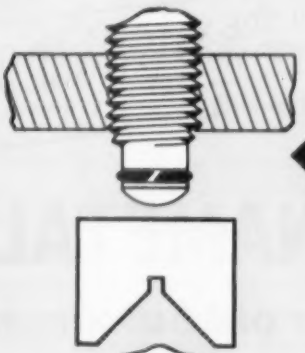
PATENT APPLIED FOR

SIZES — ¼-20 to ⅝-11 **LENGTHS — 1" up to 5¼"**

There is a dealer near you that stocks Northwestern Tools—Write for information.

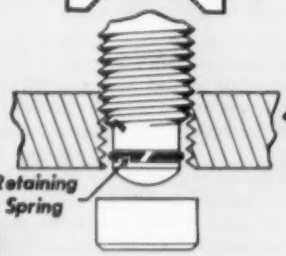


Simple Quick Assembly • SNAP ON SNAP OFF



10° ADJUSTMENT *in all directions*

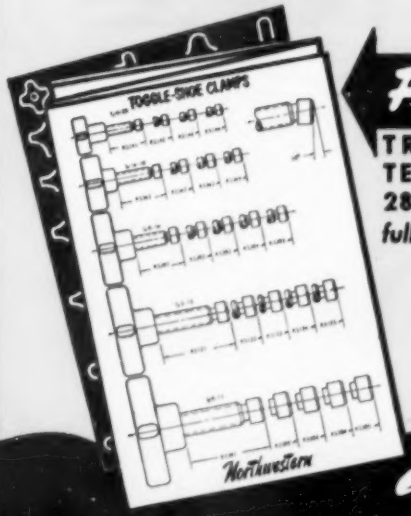
Retaining spring holds shoe in place yet allows a full 10° adjustment in all directions.



Retaining Spring

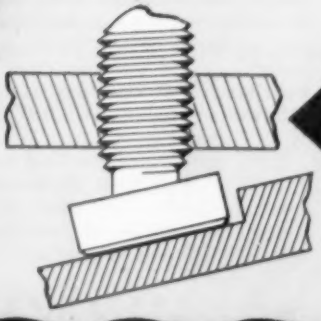
NO INTERFERENCE

Shoe only ⅛ larger than bolt

Short shoe design requires a minimum distance between fixture and the work.

Free

TRACING TEMPLATE 286 ITEMS

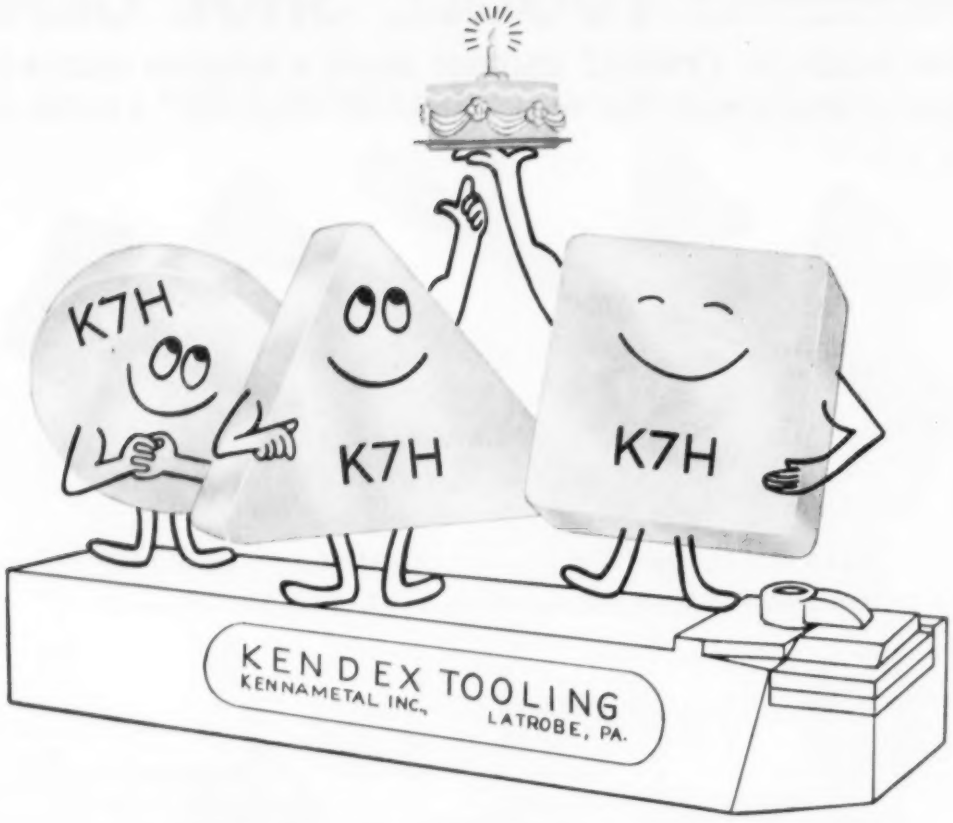
full Scale • •



HEAT TREATED *for max. toughness*

Screw is heat treated for long life—shoe is heat treated to prevent marring of work.

122 HOLLIER AVE. **Northwestern** DAYTON 3, OHIO



KENNAMETAL* K7H

only a year old but already a champ

After only a year, Kennametal Grade K7H is the proven leader in high velocity machining and in cutting heat-treated and high tensile steels. Its high hardness (93.5 Rockwell A) combined with exceptional strength (three times that of the non-metallics) provides outstanding wear resistance and maximum resistance to cratering . . . high resistance to shock . . . fast cutting and excellent finish.

K7H "throw-away" inserts used with Kendex tooling are improving production and reducing tooling costs over a wide range of applications. Here are a few typical performances:

Production *increased 50%* by substituting K7H on an SAE 8620 forging with a finish cut .060″ deep, 900 sfm, and .018″ feed. K7H machined the same number of pieces per cutting edge as did a competitive carbide at a much slower speed.

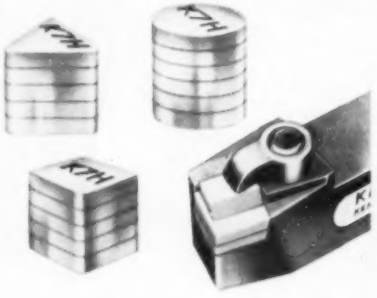
K7H cuts *252 pieces as compared to 30* . . . the best record for a competitive carbide in facing cut to dead center of SAE 1018 steel 5″ O.D. gear blank, at 1000 sfm (at outer edge) and .008″ depth of cut.

In a carbide evaluation test, the lineal footage cut by K7H was *five times* the best footage machined by any of three competitive grades tested . . . and with less than .005″ wear land. Material used: Halcomb 218 steel, 48 Rockwell C, .030″ depth at .010″ feed.

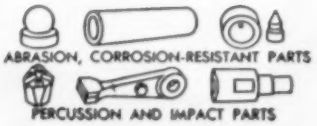
K7H *maintained excellent surface finish* . . . less than 10 microinch finish in cutting 4340 steel at 1000 sfm; 30 to 60 microinch finish in cutting 1095 steel at 1500 sfm.

Try K7H on your hard-to-machine materials and high velocity jobs. A Kennametal tool engineer can help you take advantage of this exceptionally strong Kennametal grade. Discuss your machining problems with him. Or write KENNAMETAL INC., Latrobe, Pennsylvania.

*Trademark C-3099



INDUSTRY AND **KENNAMETAL** ...Partners in Progress



they're both two diameter drills.....

BUT WHICH ONE SHOULD YOU USE?

A Mohawk SUBLAND ..... NATURALLY!!

Mohawk Sublands are the modern, practical answer to faster, more accurate and economical drilling of multiple diameter cavities.

One Mohawk Subland drill will outwork and outperform two, three, four or more ordinary step type drills . . . and do the job better.

Why? Because Mohawk Sublands last longer, stay accurate through multiple regrinds and reduce hole costs. They quickly pay for themselves in man hours, equipment and tool dollar savings. And . . . they're available in an amazing range of "off the shelf" size-optional sizes and types.

Facts For Free!

Write, wire or 'phone today for your free copy of the big illustrated brochure Sublands vs Step tool operations. It's yours for the asking . . . and if you're interested in combination drilling operations, you'll find dozens of ways to save your equipment dollars.

NORMAL DELIVERY ON MOHAWK SIZE-OPTIONAL SUBLANDS TEN DAYS FROM RECEIPT OF ORDER!

world's largest producers of Sublands

Mohawk TOOLS, Inc.

MONTPELIER, OHIO

COVEL SURFACE GRINDERS

NEW No. 17
10" x 16"
Hand Feed

Offers large capacity at low cost! The new Covel No. 17 handles die block and general tool room work with efficiency and speed.

Minimum floor space! Elevating handwheel **below** table level. Hard chrome tableways can be supplied to eliminate re-scraping. Timing belt drive for smoother grinds. Life-time sealed precision ball-bearing spindle. Hardened and ground lead screws.

These and other Covel features give you **more value** for your money. Wet grinding attachment available.

Write for Catalog 17TE4

for LARGE CAPACITY!
Hand or Power Feed . . .

BIG No. 60
14" x 24"
Hydraulic Feed

Fifteen inch cross feed with hydraulic rapid traverse, power elevation and high speed table insure large capacity with this precision machine.

Minimum Floor Space! Many Covel "firsts" and advanced features make No. 60 preferred for grinding trim, mold and forming dies, plastic mold and die casting dies.

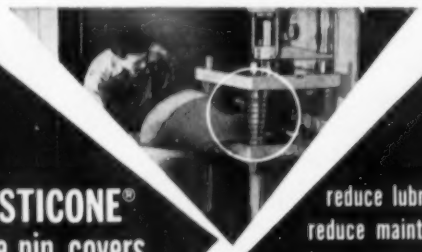
Hard chrome tableways can be supplied to preserve original accuracy for years. Table speeds 18' to 90' per minute. Large hand-scraped vertical ways. 14" diameter grinding wheel takes heavy cuts easily. Three speed spindle reduces grinding wheel costs. Hardened and ground cross feed and elevating screws. Automatic lubrication of all bearing surfaces and many other features found only on Covel No. 60.

Write for Catalog 60TE4

Covel offers the widest choice in Surface Grinders up to 14" x 24". Cutter and Tool Grinders. Drill Grinders. Optical Comparators.

COVEL PRECISION GRINDERS
BENTON HARBOR, MICHIGAN

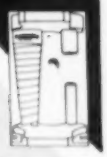
FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-5-294-1



new **ELASTICONE®** guide pin covers **CUT DIE COSTS 25%**

reduce lubrication
reduce maintenance
increase press time
preserve alignment

Discover how inexpensive ELASTICONES can provide increased production, lower die costs by closing the gaps between pins and bushings, reducing die breakage and maintenance. Just snaps into place — no installation or maintenance costs! Bulletin 53 contains complete information. Send for it today!



CENTRAL *Safety Equipment Co.*
6615 MARSDEN ST. PHILADELPHIA 35, PA.

For complete information on Elasticones and a copy of Bulletin 53 use convenient coupon.

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Firm Name_____
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TE-5-57

USE READER SERVICE CARD; INDICATE A-5-294-2

To Cut Your Tapping Costs, GRIND and RE-GRIND YOUR TAPS ACCURATELY!

Use these basic hook angles as a starting point for better tapping.

Aluminum	18°	Cast Iron	5°	Brass	5°
Copper	18°	Magnesium	18°	Plastics	8°
Mild Steel	8°	Stainless Steel	12°		

Write for specific details on how the BLAKE Flute and Chamfer Grinders give you the accuracy you need for low tapping costs.

Controlled Grinding of Tap Flutes and Chamfers

EDWARD **BLAKE** COMPANY INC.
450 CHERRY ST. WEST NEWTON 65, MASS.

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DIE BOOK
CONTAINS CONDENSED PRACTICAL AIDS FOR EXPERIENCED
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Revised Edition Contains Answers to Over 1000 Practical Die Problems With Use of Direct Reading Tables and Formulas.

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ALL IN ONE COMPACT HANDBOOK . . . direct answers to die problems. Saves time. Eliminates mathematical calculations. Avoids costly errors. Contains invaluable formulas and tables for quick reference.

Formulas and Direct Reading Die Tables on the following types of dies: Bending and Forming Dies, Blanking Dies, Drawing Dies, Square and Rectangular, Drawn Shells, Miscellaneous Tables and Charts.

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USE READER SERVICE CARD; INDICATE A-5-294-4

DROODLES

by ROGER PRICE

"WELL-DRESSED COMPASS"

This delightful Droodle was inspired by an old photo of my Uncle Fred, showing him all togged out and rarin' to go in the 1924 Olympics in Constantinople. This disconcerted everybody, because the Olympic Games were being held in Paris. The explanation was that Fred had overdone things at a bon-voyage party with friends, and was tossed onto the wrong ship. Furious with embarrassment, he embarked on an epic binge involving pizza and beer. This barred him from the hop-skip-and-jump event, of course. But by exerting a little pull he wangled his way onto the tug-of-war team and heaved his way to a glorious victory.

While we're chatting here, I'd like to give you a few facts about the Jones & Lamson Optical Comparator, which can help you set new records for inspection efficiency. This marvelous instrument measures and inspects all sorts of work pieces and components, in a variety of sizes and shapes. The J & L Comparator is rapid, and accurate to .0001"; and it's so flexible, you'll be able to perform inspections that just aren't possible by any other method. Available in eleven different models, both bench and pedestal types. Write Dept. 710 today for complete information.

Bench Model BC-7D

Floor Model FC-30

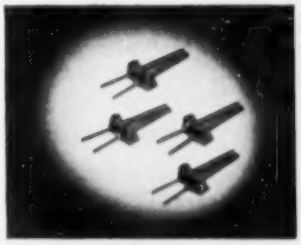
Floor Model FC-14

Table Model TC-14
(Vertical Inspection)

JONES & LAMSON OPTICAL COMPARATORS *On the Job . . .*

at Commercial Centerless Grinding Co., Cleveland, Ohio

This company, a well-known manufacturer of precision instrument parts, has been using J & L Comparators for years, to insure top quality control. A typical inspection piece is this valve pin, 5/16" hex., #416 stainless steel, which is rapidly and accurately inspected after each grinding operation, and then checked out after final grinding.



"The originator of machine tool standards in optical inspection"

JONES & LAMSON

JONES & LAMSON MACHINE COMPANY, Dept. 710, 519 Clinton Street, Springfield, Vt., U. S. A.

Please send me Comparator Catalog 402-C, which describes the complete line of J&L Optical Comparators.

name _____ title _____

street _____

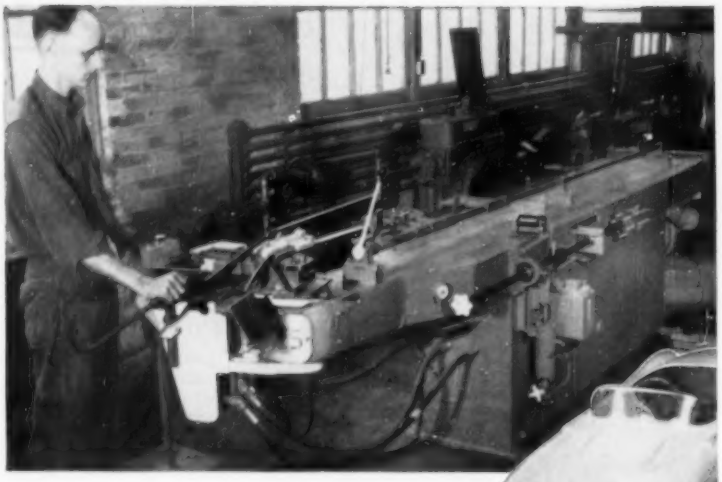
company _____

city _____ zone _____ state _____

NET PRODUCTION

840 Bends Per Hour

With PINES HYDRAULIC BENDER



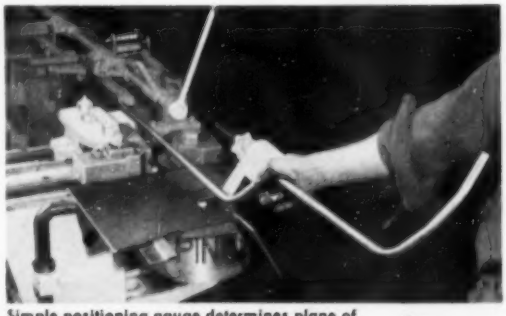
Over-all view of Pines Size ¾ Bender at Flexsteel Spring Division used for outside job work as well as for their own manufacturing needs. Application illustrates setup for bending long side members for toy Corvette car.

Automatic Cycling Speeds Job Work for Flexsteel Spring Division - Dubuque, Iowa

Here's another typical example of fast, efficient production bending illustrating the outstanding advantages of automatic cycling, a standard feature on most Pines machines. Flexsteel Spring Division, Northome Furniture Industries, Dubuque, Iowa, used this set-up to produce frames for a toy Corvette car from ⅝" 18-gauge welded steel tubing. Records show that over a period of three months, net production on workpiece illustrated averaged 140 pieces (840 bends) per hour. On this job requiring six bends of the same radii (1 13/16"), the operator simply positions the tubing for each bend and presses the forward button. Pre-set indexing stops automatically control the angle for each bend in sequence while the operator rapidly positions the workpiece. Automatic cycling saves valuable production time and accounts for the high efficiency rate maintained.

Accuracy Maintained at High Production Speeds

Another well-known advantage of Pines machines is their ability to maintain accuracy. Tolerances of .030 to .040 at several check points are commonly held without difficulty, simplifying welding, assembly, or other fabricating operations. In addition, all Pines machines are designed for small radius bending with mandrels, as well as for bends of the type illustrated not requiring mandrels. For accuracy and efficiency, it will pay you to specify Pines.



Simple positioning gauge determines plane of each bend. View shows position for making sixth bend for right-hand frame member. Both right-hand and left-hand members are produced on same setup.

PINES ENGINEERING CO., INC.

Specialists in Tube Fabricating Machinery

693 WALNUT • AURORA, ILLINOIS

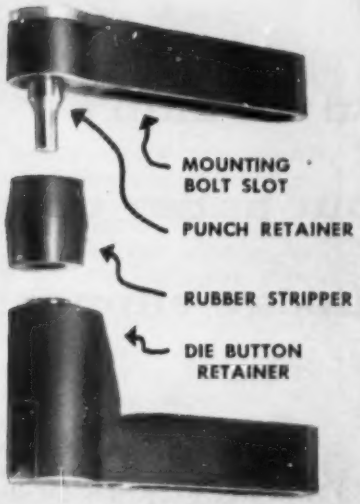
WRITE FOR *Free* DATA SHEETS

Ask for up-to-date case study material on production bending the "Pines-Way." Full information available, including tooling and setup data used for producing steel channels, rods, extrusions, pipe, and tubing. Or for assistance on any job, ask for a Pines sales engineer to call.

PRODUCTION BENDING • DEBURRING • CHAMFERING MACHINERY

NOW!

PUNCH & DIE BUTTON POSITIONING *Flexibility* with R-B *Flex-Mount* RETAINERS

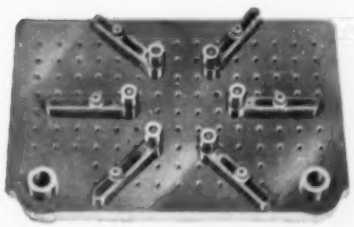


Cut your set-up time for short production runs on light gauge metals . . . R-B Flex-Mount Retainers permit quick, easy and flexible mounting of punches and die buttons. For, Flex-Mount Retainers are easily bolted in any desired position on T slotted or drilled and tapped commercial die sets.

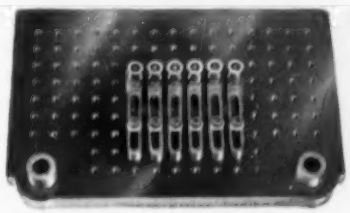
Standardized R-B punches and die buttons (round, square, oblong or special shapes to customer specifications) are used in these retainers. Stripping is accomplished with R-B rubber strippers or R-B rubber covered springs to eliminate costly metal strippers, retainer screws and springs.

Flex-Mount Retainers are available in many standard sizes.

TYPICAL *Flex-Mount* POSITIONING *Flexibility*



Shown are but two of an almost unlimited number of mounting arrangements that can be made with Flex-Mount Retainers.



Use R-B Engineering Service for Your Piercing Problems

RICHARD BROTHERS PUNCH DIVISION
ALLIED PRODUCTS CORPORATION
DEPT. 88 • 26490 CAPITOL AVENUE • DETROIT 39, MICHIGAN

You wouldn't cut out paper dolls with a hedge clipper!!

Then why shear 6-inch wide material with a 10-foot shear?

Cutting a small piece of light metal, plastic or rubber on a big shear is even more expensive than it is exasperating. Yet many shops, out of necessity, tie up big shears with small work.

That problem is solved by the New Lodge & Shipley 24" Speed Shear. Specially designed for fast cutting of small pieces, it has a capacity of ⅛" x 24" mild steel. Its unique work table is provided with holes which allow fast set-up of guides, templates and protractors for production of straight-side blanks at speeds up to 120 strokes per minute.

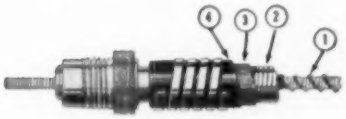
A 24" Speed Shear may easily pay for itself merely in freeing a big shear from wasteful small jobs. Investigate its possibilities in your plant. For detailed Bulletin No. PS-12, write: **The Lodge & Shipley Co., 3077 Colerain Ave., Cincinnati 25, Ohio**

Lodge & Shipley

New Hand Tool Gives Tool And Die Maker More Efficient Performance

At the Modern Tool and Die Company, Cleveland, extremely close tolerances are a constant requirement in the daily production activities. Workmen must have hand grinding tools which provide cool operation over long periods, vibration-free performance, flexibility and efficiency in use, and minimum handling fatigue.

According to the Shop Foreman, the latest hand tool that has all these advantages is the Dumore Super-Flex shaft tool. "We like it because it takes all our ¼" and ⅛" shank tools and performs extremely well on our close tolerance tool and die work. Even after day-long use, worker fatigue is practically non-existent. It has cool operation and is vibrationless. The 22,000 rpm output gives us ample speed for clean, fast, precision metal removal. It is the handiest, most efficient hand tool we have."

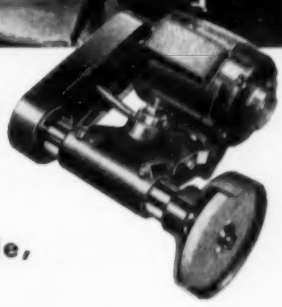


BUILT-IN EFFICIENCY

Bronze liner encircles the shaft (1) which acts as a bearing and confines rotation within a definite radius. It prevents vibration, whipping and acts as lubricant to the shaft. The armored wire casing (2) is surrounded by wire braid (3) for further insulation and covered with neoprene (4) which is oil, grease and water resistant. For further information on the Super-Flex and other precision hand tools, write to the Dumore Company, 1310 Seventeenth Street, Racine, Wis.

Low Cost Precision Grinding Machines

made possible with versatile, all-purpose SERIES 5



DUMORE TOOL POST GRINDERS

MOUNTED ON USED MILLER BASES, the Series 5 Dumore Tool Post Grinders provide manufacturer, Scully-Jones, Chicago, with dependable high production precision grinding equipment at amazingly low cost.

As the plant manager says, "Over many years' use we have learned to expect very close tolerances, low scrap and trouble-free operation from our Dumore Grinders. The extremely low depreciation, maintenance and set-up costs make this unit one of the most satisfactory tools in the plant. As long as Dumore Grinders and serviceable used machine tools are available we need never lack for precision grinding equipment."

Series 5, Dumore Tool Post Grinder, ½ hp distributed field, continuous-duty rated universal motor. Speeds from 4600 to 42,500 rpm for wheels from ⅛" to 5". Performs a wide variety of internal and external grinding jobs at high production rates. Accuracies to .0001" and surface finishes of 6 to 8 micro-inches. For lathes with 13" to 18" swing . . . and . . .

Mounts on any basic machine tool — planers, shapers, mills, grinders, lathes — to provide precision grinding equipment at low cost. Simplified mounting makes change-over quickly — and speeds re-converting to original machine, when required. You can improvise, too, to make low cost special machines for special jobs!

Eight other models available, 1/5 to 3 hp, for every size of basic machine and type of grinding job. For complete details, write for Catalog 55-FL.

WARNING: If you own a Dumore Tool Post Grinder — don't let it sit idle in your tool crib! It's the most versatile, useful tool you own. Put it to work **now** — you'll save money and get better results!

SOLD THROUGH LEADING DISTRIBUTORS EVERYWHERE

You can do more grinding with Dumore Grinders on **any** machine tool!

DUMORE

PRECISION TOOLS

AUTOMATIC DRILL UNITS
TOOL POST AND HAND GRINDERS

1310 Seventeenth Street, Racine, Wisconsin

INCREASE PROFIT MARGIN ON FORMED STAMPINGS WITH U. S. MULTI-SLIDES®

Reduce your costs and increase your profit potential! Elimination of secondary operations and handlings results in reduced costs. It is therefore important to produce parts, wherever possible, complete in one machine. The U. S. Multi-Slide, through a combination of built-in motions, allows for the designing of tools to fabricate precision formed metal stampings without secondary handlings.

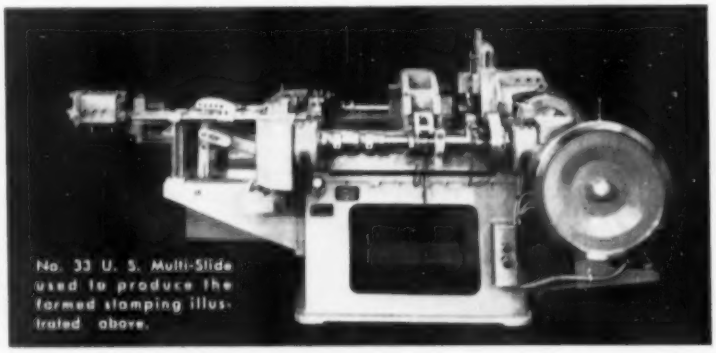
Standard equipment on the machine includes: ram action for cutting, piercing, trimming, embossing, etc.; a four-slide forming position, and a vertical movement for stripping and transferring. Since these movements are part of the machine equipment, it is not necessary to incorporate complicated movements into the dies themselves. The machines are built in four sizes, and on the three larger units it is possible to use two or more rams simultaneously, as illustrated in the sequence of operations drawing below.

Investigate. Ask for a copy of our Bulletin 15T, or send us part drawings or samples for our recommendations.

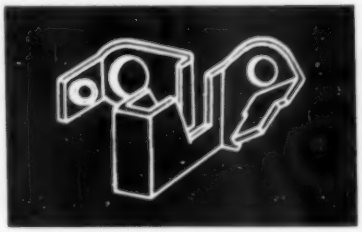
U. S. TOOL COMPANY, INC.

Ampere (East Orange) **New Jersey**

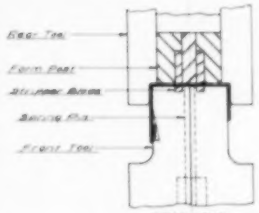
Builders of U. S. Multi-Slides — U. S. Multi-Millers — U. S. Automatic Press Room Equipment—U. S. Die Sets and Accessories

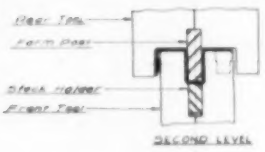


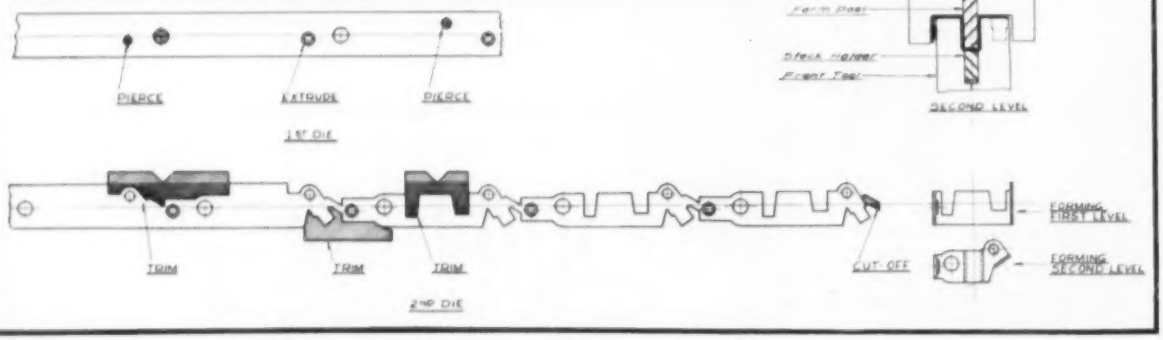
No. 33 U. S. Multi-Slide used to produce the formed stamping illustrated above.

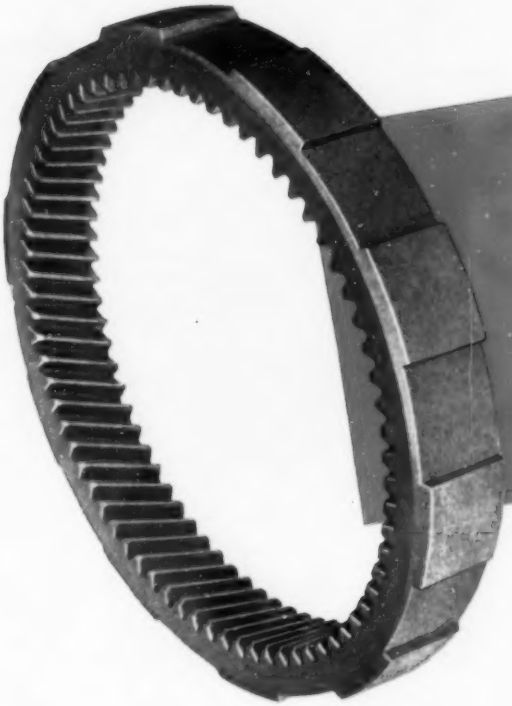


The automotive component shown above is produced complete, without secondary operations, in the No. 33 U. S. Multi-Slide Machine. Drawings below indicate the sequence of stages in the dies and forming positions. Observe the two-level forming position used to complete the piece after cutting off.







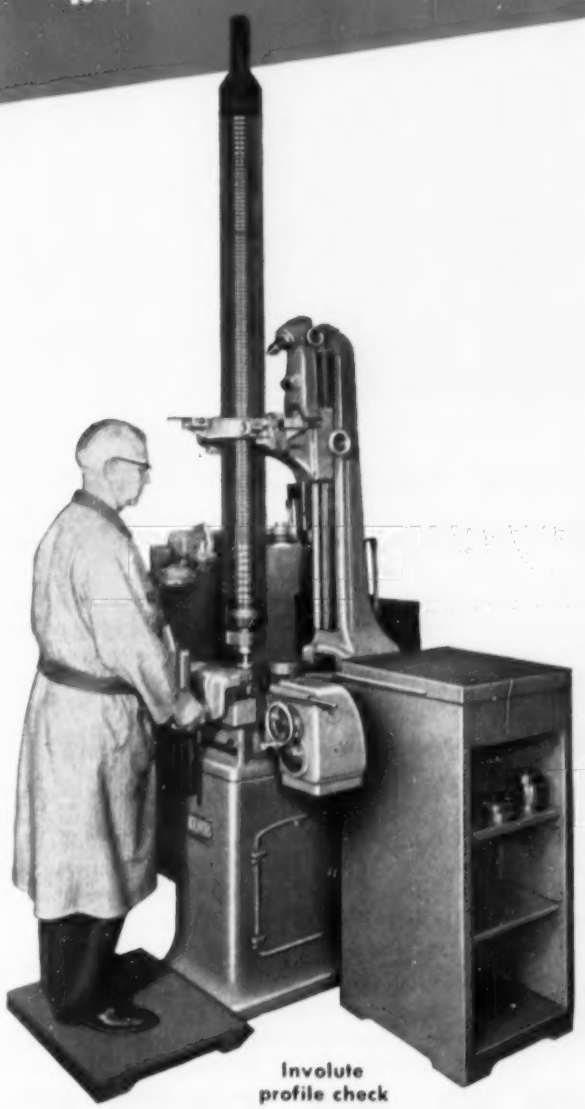


WHY YOU GET BETTER HIGH SPEED INTERNAL GEARS AT MINIMUM COST WITH RED RING NALOY BROACHES

- Gear is completely cut from the solid blank in just one pass. A quick shaving operation or a finish broaching pass completes it.
- Critical gear characteristics held to tolerances of .0002".
- All gears produced are interchangeable regardless of the number of broaching tools in use.

The secret of combining spectacular economy with such high gear precision lies in the broaching tools themselves. Special manufacturing processes are used. Each is under the constant control of Red Ring metallurgists and engineers in this company's own plant.

The real proof of Red Ring methods is reflected in actual performance figures. Ask to see them.



Involute profile check

7680

SPUR AND HELICAL GEAR SPECIALISTS
ORIGINATORS OF ROTARY SHAVING
AND ELLIPTOID TOOTH FORM

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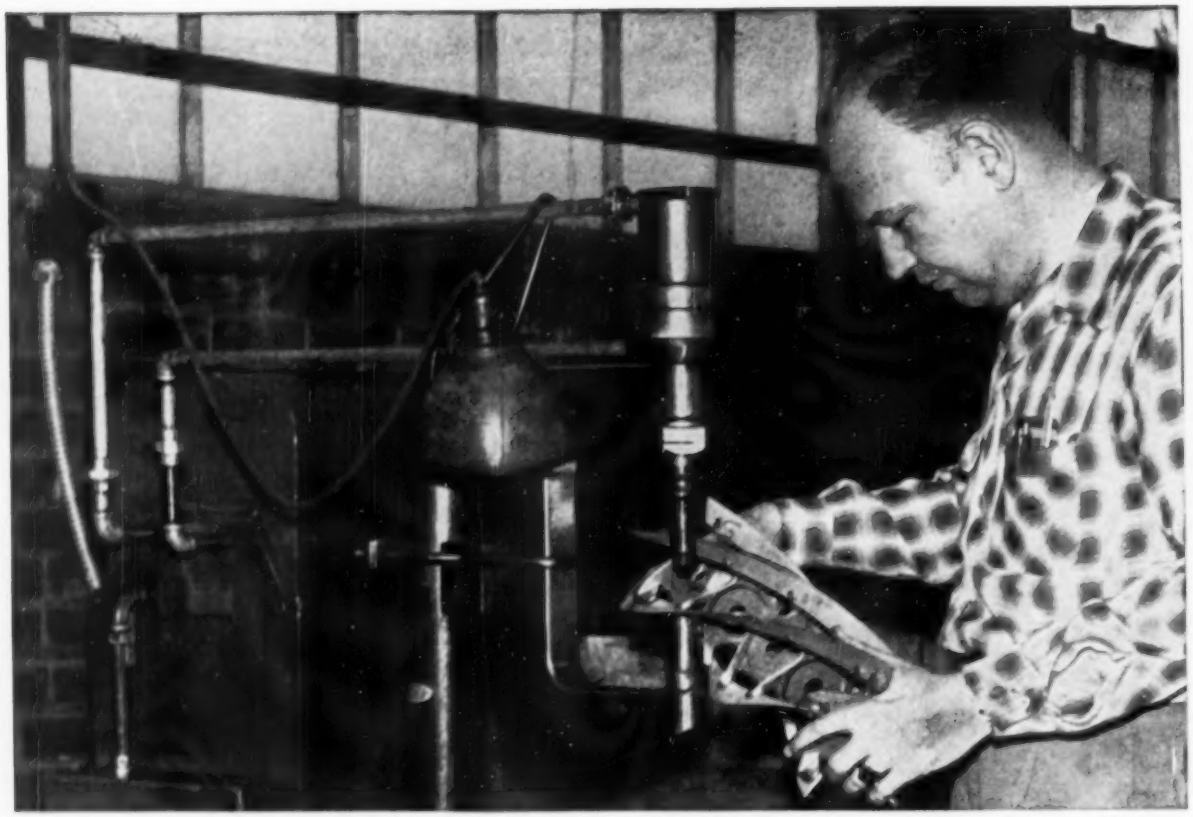
WORLD'S LARGEST PRODUCER OF GEAR SHAVING EQUIPMENT



Courtesy Eclipse Lawn Mower Company, Prophetstown, Illinois

HOW TO MAKE A BETTER ASSEMBLY CHEAPER

RIVETING THE "HY-POWER" WAY

Lawn mower blades must be fastened to the reel tightly and *in perfect alignment* to assure product performance and acceptance. That's why the Eclipse Lawn Mower Company, Prophetstown, Illinois (as well as many other leading lawn mower manufacturers), uses Hannifin "Hy-Power" cold-squeeze riveting.

What's your assembly problem?

If you haven't investigated fast, safe, clean cold-squeeze riveting, perhaps you should! Parts are drawn tightly together under quiet, relentless hydraulic pressure. Rivet shanks expand to fill the hole completely, making the tightest joint possible; heads are formed to any shape and every rivet is identical. And, with this modern push-button-controlled method, operators need no special training to apply it.

"Hy-Power" Riveters are available, standard or special, for portable use or in fixed mountings, as shown. Power source is the exclusive Hannifin "Hy-Power" Hydraulic Pressure Generator—so dependable that the first model, made nearly 20 years ago, is still in daily use.

ONE RIVET AT A TIME OR SEVERAL!

Hannifin "Hy-Power" Riveting is ideal for multiple installations where several "Hy-Power" Cylinders—available in capacities from 7½ to 100 tons—advance, rivet and retract in unison. Your Hannifin representative is anxious to help you select exactly the "Hy-Power" installation you need. Why not call him in? Meanwhile, get the full story by writing for Bulletin 150.

HANNIFIN

Hannifin Corporation, 519 S. Wolf Road, Des Plaines, Ill.

Air and Hydraulic Cylinders • Hydraulic Presses • Pneumatic Presses • "Hy-Power" Hydraulics • Air Control Valves

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NEW High Production Flat Lapping Facilities

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6400 Oakton Street, Morton Grove, Ill.

Need parts finished to precision flatness?

Read this folder

If you're looking for someone to produce precision flatness on your parts, our flat lapping service department is equipped to produce parts with a flatness of .000011 inch or less and finishes to 2 micro inches on a wide range of sizes in large or small production runs. Materials range from steel, Stellite, cast iron, brass and aluminum to plastics, glass, ceramics, carbons and many others.

Thirty-six machines, together with "know how" and precision inspection facilities, insure work to meet your requirements. Branch service plants are also located in Houston, Los Angeles, Miami, New York, Philadelphia and Hamilton, Ontario.

For complete information, write for this free folder today.

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Lapmaster® DIVISION

CRANE PACKING COMPANY

38 YEARS INDUSTRIAL PROGRESS

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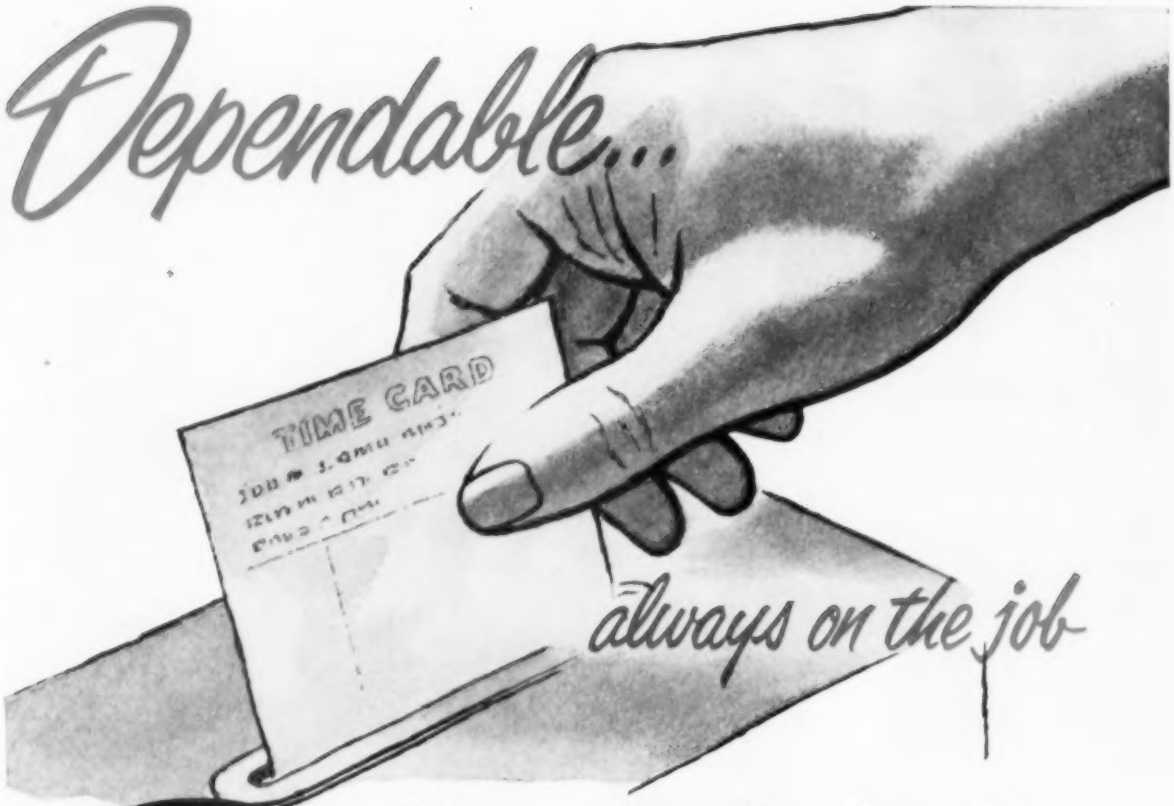
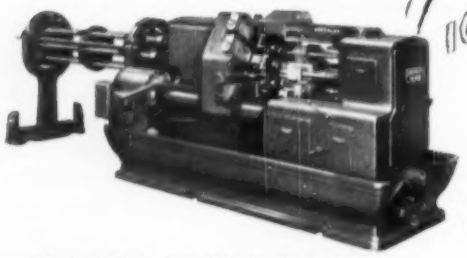


always on the job

PRODUCTION MACHINERY

GREENLEE Automatic Bar Machines



SIX AND FOUR-SPINDLE AUTOMATIC BAR MACHINES

GREENLEE Special Machine Tools

- Multiple-Spindle Drilling and Tapping Machines
- Transfer-Type Processing Machines
- Hydro-Borer Precision Boring Machines

BOOST PRODUCTION REDUCE DOWN TIME

It's easy to maintain rigid production schedules . . . prevent costly bottlenecks with Greenlee Bar Automatics. They are always on the job . . . give continuous, reliable service.

You hear much comment about Greenlees' uninterrupted, round-the-clock performance in widely different industries. With good reason, too, for Greenlee offers years of manufacturing experience... plus manufacturing integrity not often duplicated.

Want complete information? Call in the Greenlee man. Let him give you the complete story. Please submit a print when inquiring about a specific job.

WRITE FOR CATALOG No. A-405

GREENLEE BROS. & CO.

1985 MASON AVENUE
ROCKFORD, ILLINOIS

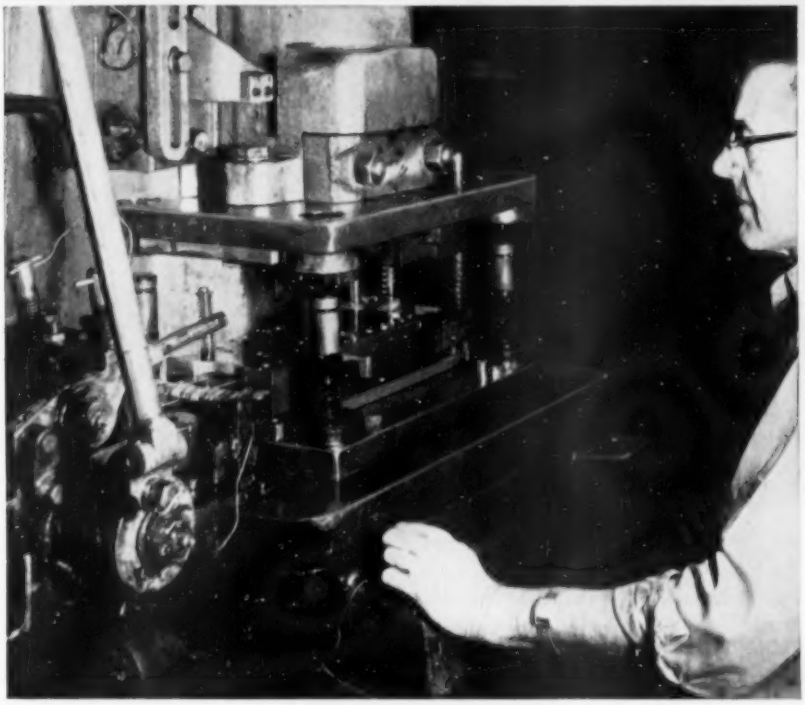
Tool Steel Topics

BETHLEHEM STEEL

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

Export Distributor: Bethlehem Steel Export Corporation



Lehigh H does good job in blanking-and-forming die

Wear-resistance, low distortion, and high compressive strength were the tool-steel requirements needed for a blanking and forming operation at Hickory Springs Manufacturing Co., Hickory, N. C., makers of bed rails and platform rocker hinges. Their choice, and it was a good one, too, was Bethlehem Lehigh H.

The jobs involved blanking and forming cold-rolled strip in thicknesses from 0.060 in. to 0.078 in., in presses of up to 80 tons capacity. The Lehigh H dies, hardened to Rockwell C 58-61, performed satisfactorily, producing about 100,000 pieces between grinds. Only 0.015 in. was removed in redressing.

Bethlehem Lehigh H is an outstanding high-carbon, high-chromium grade of air-hardening tool steel, with the characteristics to take the tough jobs in stride.

TYPICAL ANALYSIS

Carbon 1.55	Molybdenum 0.80
Chromium 11.50	Vanadium 0.40

You'll like Lehigh H the very first day you put it to work. But don't baby it! Give it a real test, one that requires a combination of wear-resistance, shock-resistance, and compressive strength. Your Bethlehem tool-steel distributor has Lehigh H tool steel in stock. Why not call him right now, while you have it in mind.

You Save Time with Hollow-Bar →

If you work with hardened bushings, ring dies or draw rings—in fact, any part requiring a center hole in the steel—you'll save time by using Bethlehem Hollow-Bar Tool Steel. Bethlehem Hollow-Bar is made by a high-speed trepanning process, by which hammer-forged or hot-rolled bars are cored out, then rough-turned on the outside. Hollow-Bar arrives ready to go to work. There's no time lost, no waiting for forged rings or discs. Hollow-Bar is furnished in BTR (Bethlehem Tool Room, oil-hardening), and Lehigh H (high-carbon, high-chrome).

BETHLEHEM TOOL STEEL ENGINEER SAYS:

You Can Salvage Tools Which Have Grinding Cracks

When produced, grinding cracks are usually shallow (0.002 in. to 0.004 in.). If their presence is detected early, it is often possible to salvage the tool, assuming that metal-removal will not render the tool unusable. This can be done by cautious grinding, which removes but a small amount of metal (0.00025 in. per pass), and does not generate excessive heat. To keep heat at the minimum, use a soft, coarse-grit, 36-grain wheel, plus a liberal amount of liquid coolant.

If a number of light cuts are taken, with intervals between cuts to prevent building up temperature, the grinding cracks can be removed, so long as the tool has been properly heat-treated. But if ordinary grinding technique is used, the cracks will enlarge ahead of the grinding wheel, and ultimately will go all the way through the section.

Magnetic-powder testing is required for examination of the tool during the salvage operation, in order to determine when the cracks have been removed. If grinding cracks are detected before a tool is used (this requires magnetic-powder testing in most instances), salvage is usually successful. But should a tool be put in service with undetected grinding cracks, salvage may be impossible because of growth of the cracks in service.

cost-saving tips on SPECIAL SCREWS

1. **USE STANDARD SCREWS IF POSSIBLE.** Save money by designing the *job* to the *screw*. Use specials only where absolutely required.
2. **DETERMINE YOUR APPLICATION REQUIREMENTS.** Over-design and under-design both waste money.
3. **CONSULT A FASTENING SPECIALIST.** Do this before finalizing your design. His suggestions may lead to a simpler, lower-cost answer.
4. **DON'T MAKE SPECIALS YOURSELF.** It actually costs *less* to use a dependable, experienced screw manufacturer. No hidden costs, no tie-up of your valuable men and machines.
5. **BUY FROM YOUR INDUSTRIAL DISTRIBUTOR.** He can expedite delivery, provide valuable local services and is convenient for re-ordering.

■ Your most dependable source for special screws is *Mac-it*. Production flexibility assures maximum quality at lowest cost; engineering assistance is always available; personal attention to each order by craftsmen means exact compliance with your blueprint specifications.

For finest service and fastest delivery on orders for one or 100,000 "specials", contact your local *Mac-it* distributor or: Mac-it Screw Division, Strong, Carlisle & Hammond, 1392 West 3rd Street, Cleveland 13, Ohio.

See us at the Design Engineering Show Booth 1413.

MAC-IT hex socket alloy cap & set **SCREWS**

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NEW MACHINE NEW MEDIA Reduce Your Deburring Costs

● Is DEBURRING required on your products? Do you realize the savings that can be made by the Barrel Finishing process? Write us today and get full details about this new, improved machine. SEE its value on your parts . . . Send samples for free processing today.

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Barrel Finishing Equipment • Media • Compounds

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MAYLINE

The MAY-O-MATIC Drafting Table

A table the draftsman will enjoy. A touch of a lever enables him to adjust for table height and top slope. He can reach easily any part of his drawing; and he can change his working position at his convenience.

Send today for literature describing the May-O-Matic table. Ask also for the 4-Post steel base table.

MAYLINE COMPANY INC.
611 No. Commerce St.
Sheboygan, Wisconsin

STEEL 4-POST TABLE

MAYLINE

MAYLINE

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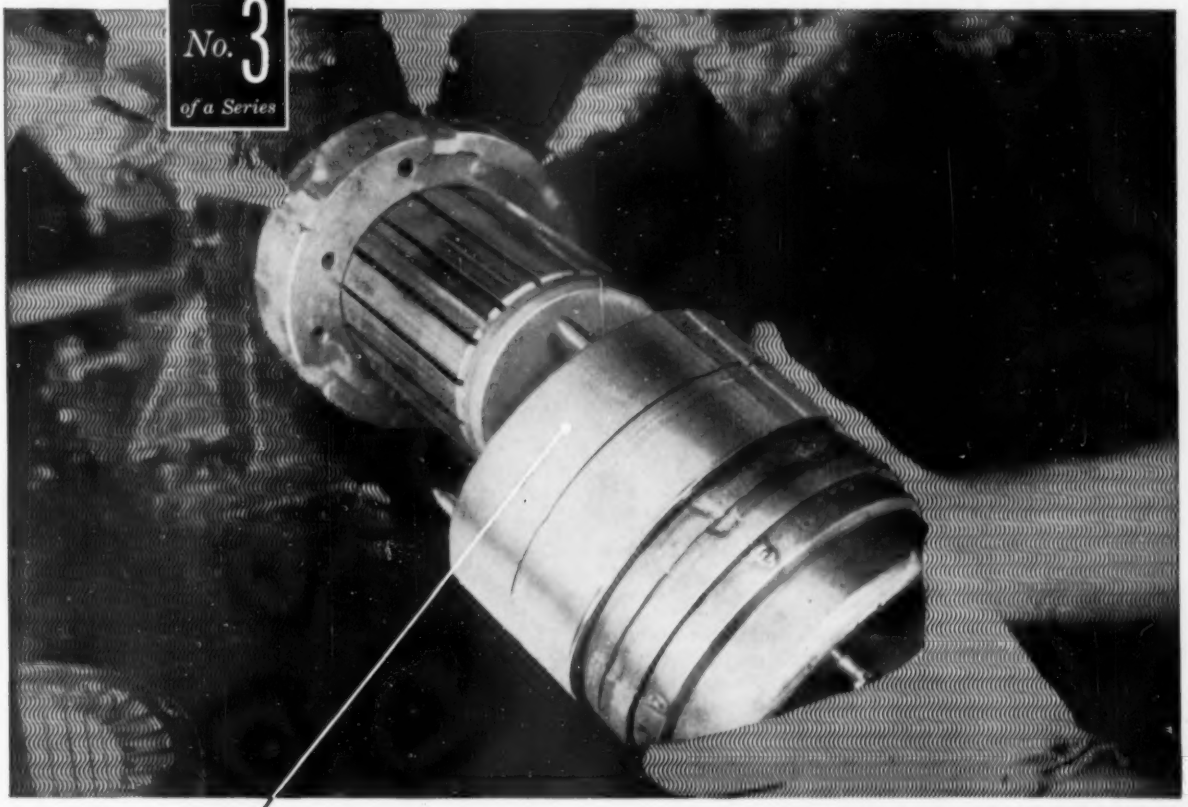
Erickson Precision Expanding Mandrels Solve Assembly Problems

No. 3 *of a Series*



Photos: Courtesy The Emerson Electric Mfg. Co., St. Louis

e.g. electric motor stators

Emerson Electric, big-name electrical manufacturer, assembles stator laminations the modern way—with Erickson Mandrels. Gone are the old-fashioned arbor assembly methods that require a large tolerance between laminations and arbor . . . that lead to eccentricity of stator bore and to additional finishing operations on the OD.

Emerson Electric works "from the inside out" with Erickson Precision Expanding Mandrels. Laminations are placed on a fixture and the fixture slipped over the expanding mandrel. Laminations are then welded together with two passes through a three-torch head.

Result? Stators are concentric within Erickson's guaranteed accuracy of five "tenths." And Emerson Electric gets a better motor with uniform air gap . . . that produces uniform torque and rated horsepower . . . that creates minimum electrical interference . . . and that lasts longer.

If this cost-cutting case history triggers your imagination, contact the nearest Erickson representative. He'll be pleased to demonstrate how Erickson Precision Expanding Mandrels can cut your assembly costs.

AA-4133

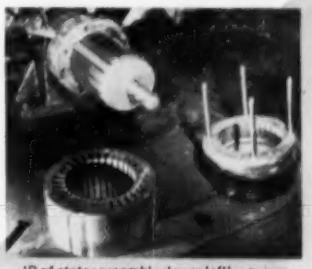
Collet Chucks
Floating Holders
Tap Chucks
Indexers

ERICKSON TOOL COMPANY

2303-5 Hamilton Avenue • Cleveland 14, Ohio

Tap Holders
Air-Operated Chucks
Expanding Collets
Special Holding Fixtures

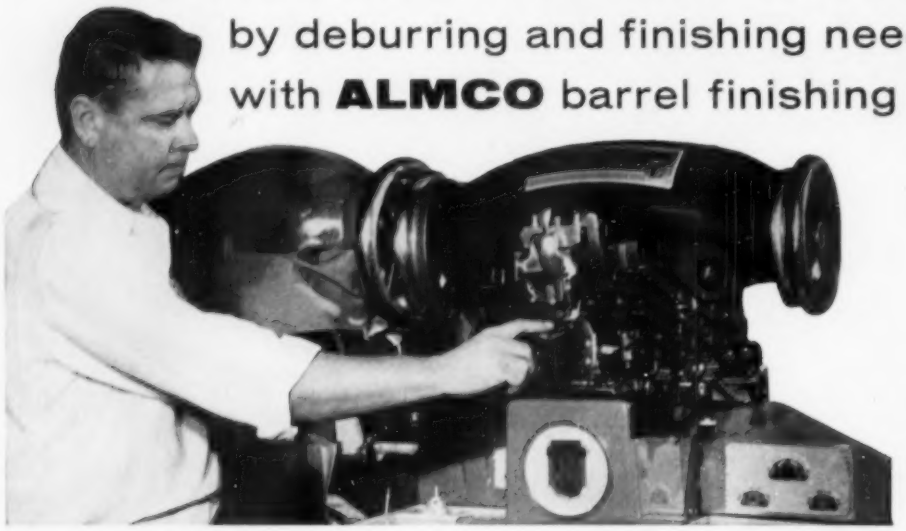
Bothered by a tough holding problem? Then let us show you how Erickson mandrels speed production, lower grinding or inspection costs. Write for Catalog K.



ID of stator assembly (lower left) requires no finishing operation after welding.

FINISHING ENGINEER AT LANDIS MACHINE CO. REPORTS...

"We cut costs from 55^{00} to 55¢ per 100 by deburring and finishing needle plates with ALMCO barrel finishing equipment"



MR. JAMES W. DUNFORD, finishing engineer at Landis Machine Co., St. Louis, points to location of needle plate in new model of Landis shoe repair machine.

BEFORE AFTER

One of the most successful barrel finishing applications on record at Almco is this needle plate deburring and finishing at Landis Machine Company.

The needle plate forgings are drilled and broached and then carefully deburred. Formerly the tough burrs were removed by hand filing at a cost of $55.00 per 100.

Now, an Almco Model DB-200 barrel finishing machine performs the same operation at a cost of 55¢ per 100, a savings of 99%!

MANY LANDIS PARTS NOW BARREL FINISHED

With this $3,200 annual savings on needle plates alone in mind, Landis engineers have applied the Almco method to other parts until the company is now barrel finishing several hundred different parts to high quality standards. Rejects are practically non-existent.

VERSATILE EQUIPMENT

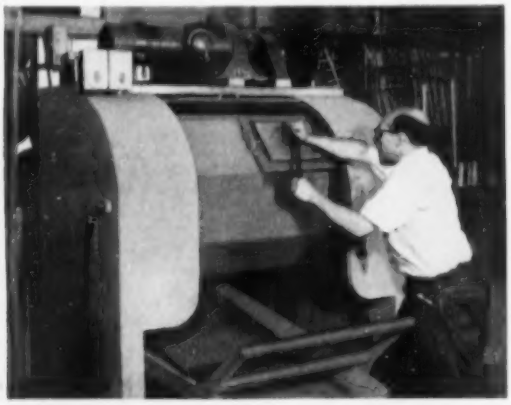
By keeping simple records on processing cycles, correct media and compound, and proper scheduling, Landis engineers can switch the Almco equipment from part to part, to meet plant production requirements exactly.

BROAD EXPERIENCE FOR YOU

Almco's experience in barrel finishing methods and techniques now covers a wide range of parts, sizes, shapes, metals, and operations. Almco maintains sample processing laboratories for the purpose of analyzing product parts and desired results. Let Almco technicians work out procedures to give you the quality you want at the lowest possible finishing cost.

REQUEST YOUR REPORT

Simply write on your company letterhead, requesting an Almco engineer to call on you. Or, send your sample parts and specifications on results direct to Almco. You will receive a detailed report at no obligation.



Finishing department operator at Landis Machine Co. gets ready for parts deburring run in Almco barrel finishing machine. Almco construction is heavy-duty throughout, to stand up under rugged requirements month after month.

SEND FOR THIS NEW BARREL FINISHING HANDBOOK

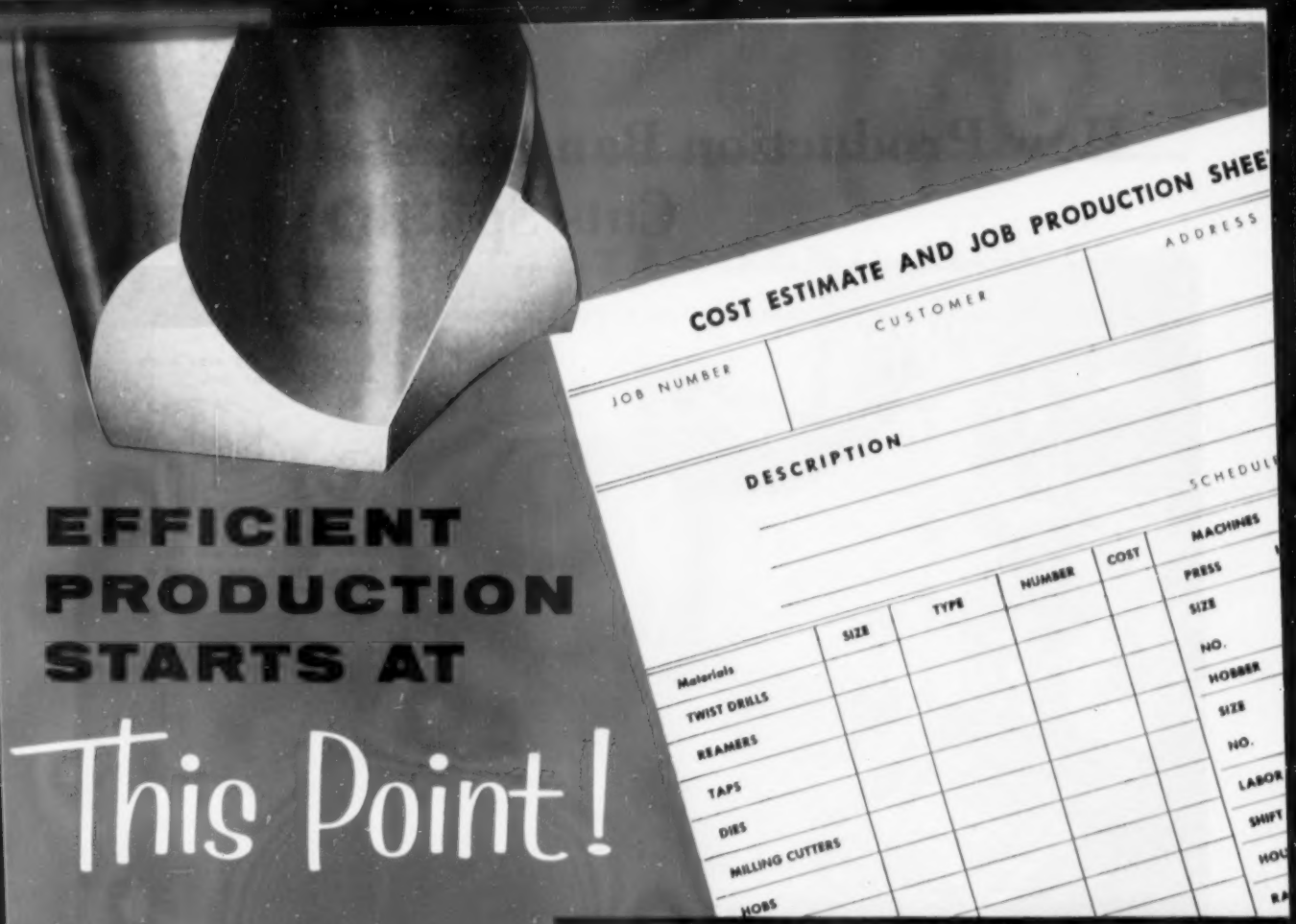
Complete description of the most advanced modern processes. 52 pages of facts, photos, data and cost comparison charts. Write for your personal copy today.

ALMCO

DIVISION OF QUEEN STOVE WORKS, INC.

185 Marshall Street • Albert Lea, Minnesota

Sales Engineering Offices in Chicago, Detroit, Los Angeles, Newark, New Haven, Philadelphia and London, England.



EFFICIENT PRODUCTION STARTS AT This Point!

Complete line stocked by the Standard Tool Distributor in your area

Profits build up when this point "takes hold" *fast!*

Why? Obviously the only function of a Twist Drill is to make holes. And the faster it makes them—with no "time out" for re-sharpening—the more you can make *from them.*

So say "Standard" and get *more* holes for your money . . . *many more!*

Quality Tools Since 1881

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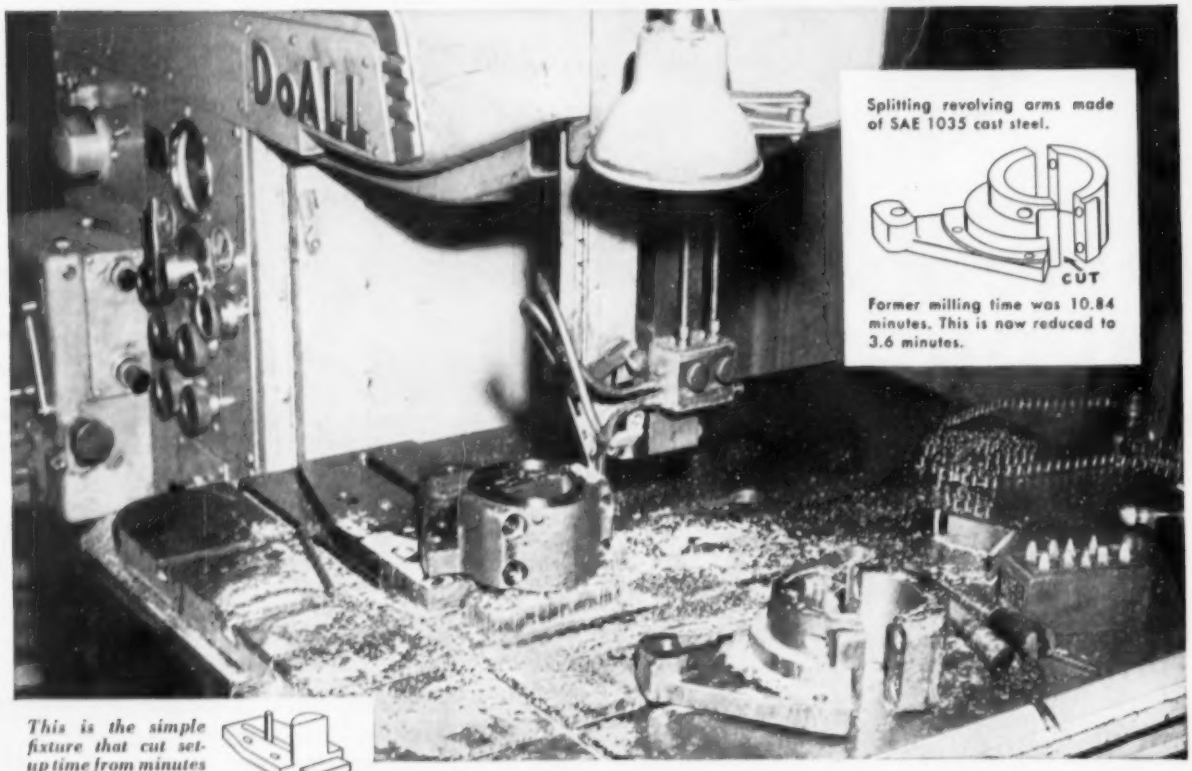
THE STANDARD LINE: *Twist Drills · Reamers · Taps · Dies · Milling Cutters · End Mills · Hobs · Counterbores · Carbide Tools · Gages*

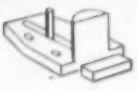
How Production Band Machining Cuts Splitting Costs



Splitting revolving arms made of SAE 1035 cast steel.

Former milling time was 10.84 minutes. This is now reduced to 3.6 minutes.

This is the simple fixture that cut set-up time from minutes to seconds.



This is the Contour-matic which doubled production with a carbon steel blade.

This is the Demon H.S.S. blade that boosted production 3 times greater than originally done on a milling machine.

Faster Cutting and Reduced Setup Time Increase Production

Literally thousands of splitting operations now being performed by other methods can be done at lower costs with DoALL production band machines.

For example, at one company, the number of "revolving arms" split in an 8-hour day jumped from 44 to 84 when band machining replaced the previous machining method... and when Demon high-speed steel blade was used instead of carbon steel saw band, production rose to 133 a day. Accuracy and finish were excellent, well within tolerances.

The inexpensive, exceedingly simple fixture used is typical of those required for band machining. Hold-down elements are unnecessary as the work is clamped to the table by the downward cutting force of the blade. DoALL offers a complete band machine fixturing service and provides design sketches free of charge.

If you do production splitting and slotting, it will pay you to call your local DoALL Sales-Service for a free demonstration in your plant, or write:

THE DoALL COMPANY, Des Plaines, Illinois

DoALL

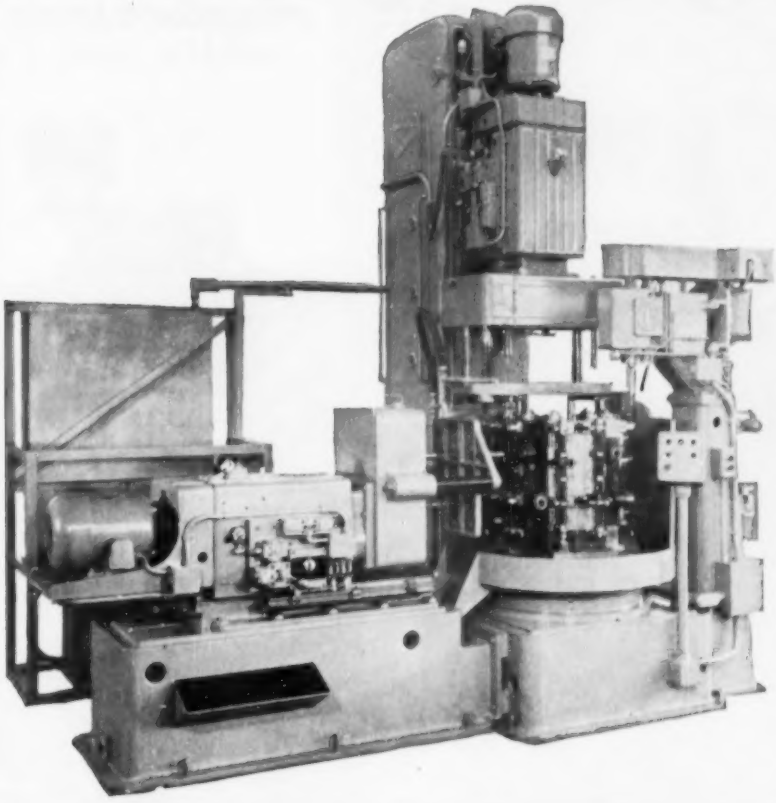
FREE LITERATURE AND MOVIES—The new 16-page saw band catalog and the new contour-matic catalog are now available as well as two sound-color movies for group showings—"Production Band Machining" (30 min.), and "Production Tooling" (10 min.).

Friendly DoALL Sales-Service Stores in 38 cities—call yours today!

P8-30

Another Special by

STANDARD-MODERN



FEATURES

- Economy of construction
- Rigid strength
- Correct drill speeds
- Accurate hole location
- Infinitely variable feed rates
- Completely automatic cycle
- Double work-holding fixtures
- Automatic lubrication

This Special Purpose Machine **DRILLS, REAMS and TAPS**
131 Automotive Cam Shafts per hour at 80% efficiency.

Developed by Standard-Modern, this high production Special Purpose machine drills, reams and taps oil holes in cam shafts at the rate of 26.4 seconds each.

Two cam shafts at a time are loaded vertically into rigid work-locating fixtures, where they are held by clips until manually clamped into accurate position. Pressing the cycle start button indexes the machine through its four work stations where hydraulic drilling, reaming and tapping units advance and feed to depth.

Loading and unloading is done at the first station while drilling, reaming and tapping operations are performed.

STANDARD-MODERN Special Machines are speeding production, saving time and money for industry across Canada.

STANDARD–MODERN
TOOL COMPANY LIMITED
MANUFACTURING DIVISION

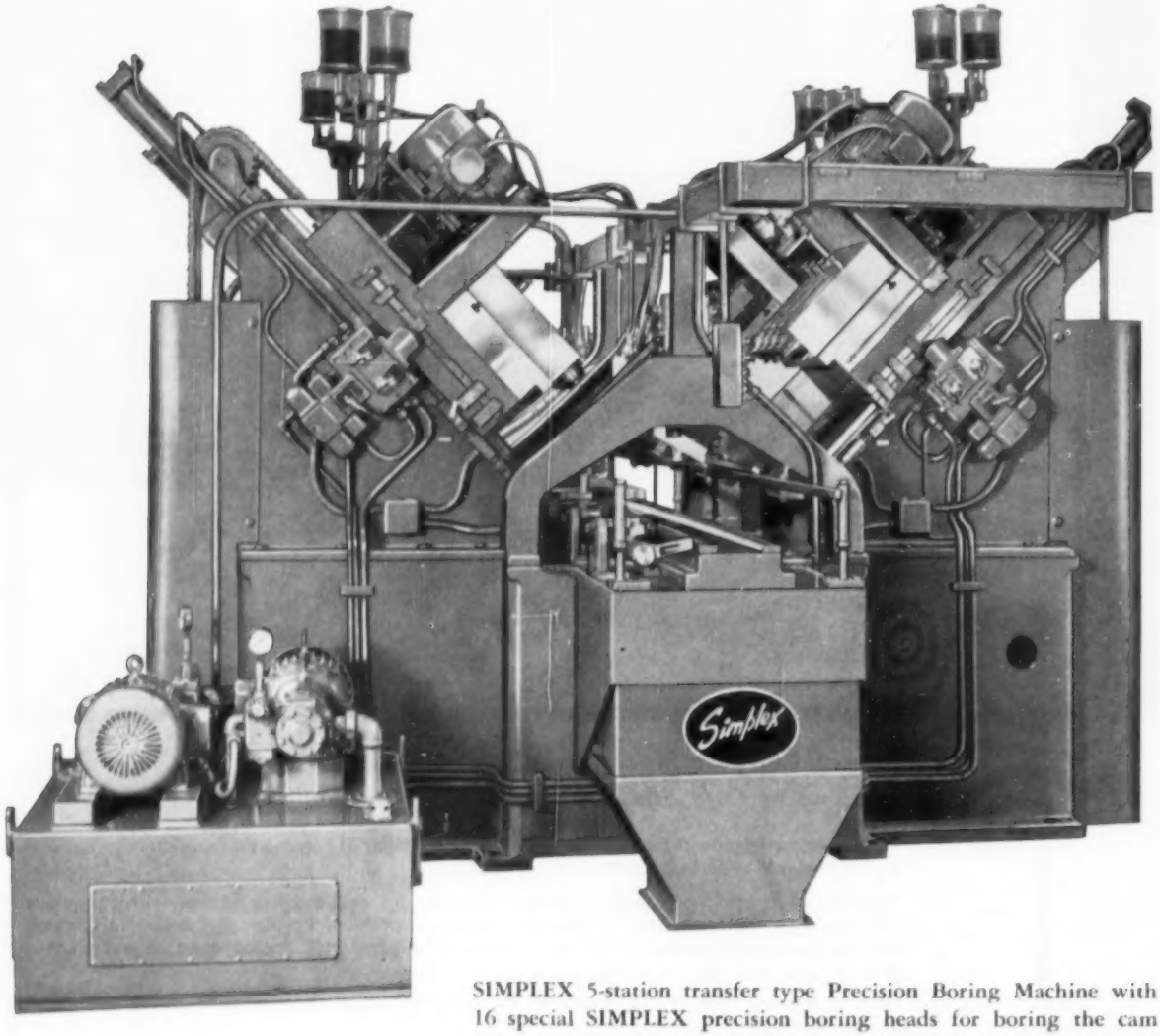
69 Montcalm Avenue, Toronto, Canada • 3030 Walker Road, Windsor, Canada

SP-5

Simplex

PRECISION BORING MACHINES

25TH Anniversary
1932 – 1957



SIMPLEX 5-station transfer type Precision Boring Machine with 16 special SIMPLEX precision boring heads for boring the cam follower holes in V-8 engine blocks. This machine is equipped with a special transfer type work holding fixture and is also designed to conform to J. I. C. standards.

SIMPLEX MACHINE TOOL CORPORATION

4528 WEST MITCHELL STREET

MILWAUKEE, WISCONSIN

PRECISION BORING MACHINES • PLANER TYPE MILLING MACHINES
SPECIAL DRILLING, TAPPING AND BORING MACHINES

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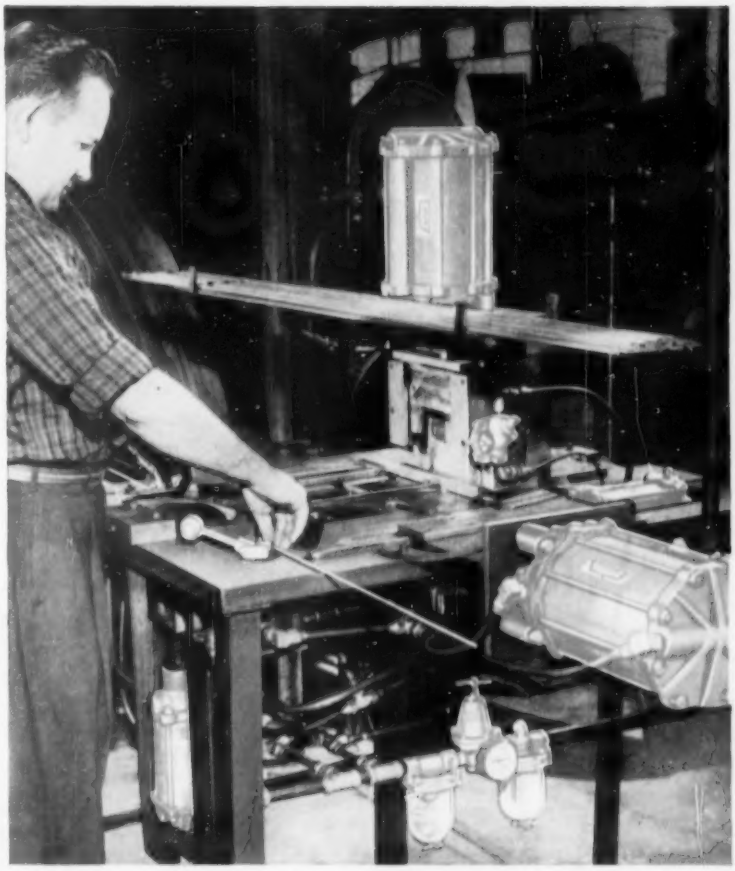
***Progress** in plan-it-yourself air systems:*

How one plant cuts forming costs 75% with Schrader Air Products adapted to jig



Outdoor grill legs formed. Operator places wire between dies. Note Schrader products. Schematic below gives Schrader "Air layout" at end of cycle with wire formed.

Before this Schrader-powered forming jig was installed, an Ohio plant used heavy punch press equipment and costly welding procedures. Now man-hours and materials have been released for other work, and a single operator produces the finished part in seconds, effortlessly. Cutting the cost of the finished product by ¾!!

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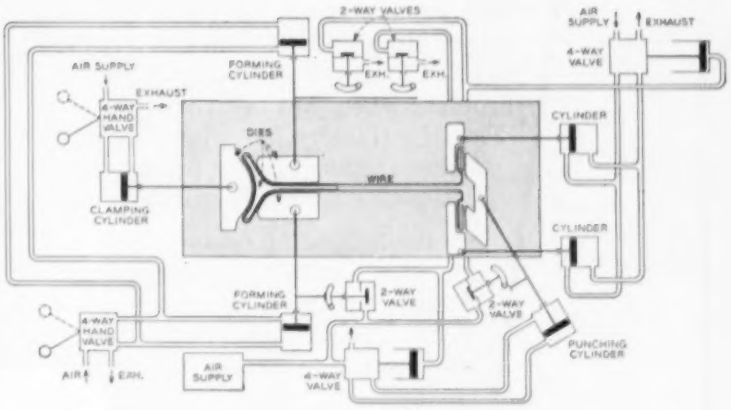

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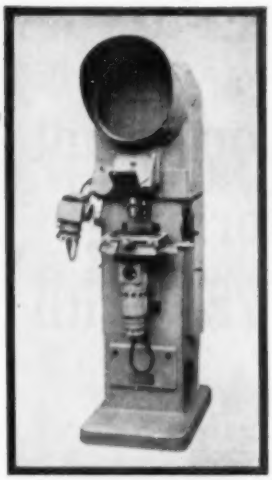
NIKON OPTICAL COMPARATOR, MODEL III



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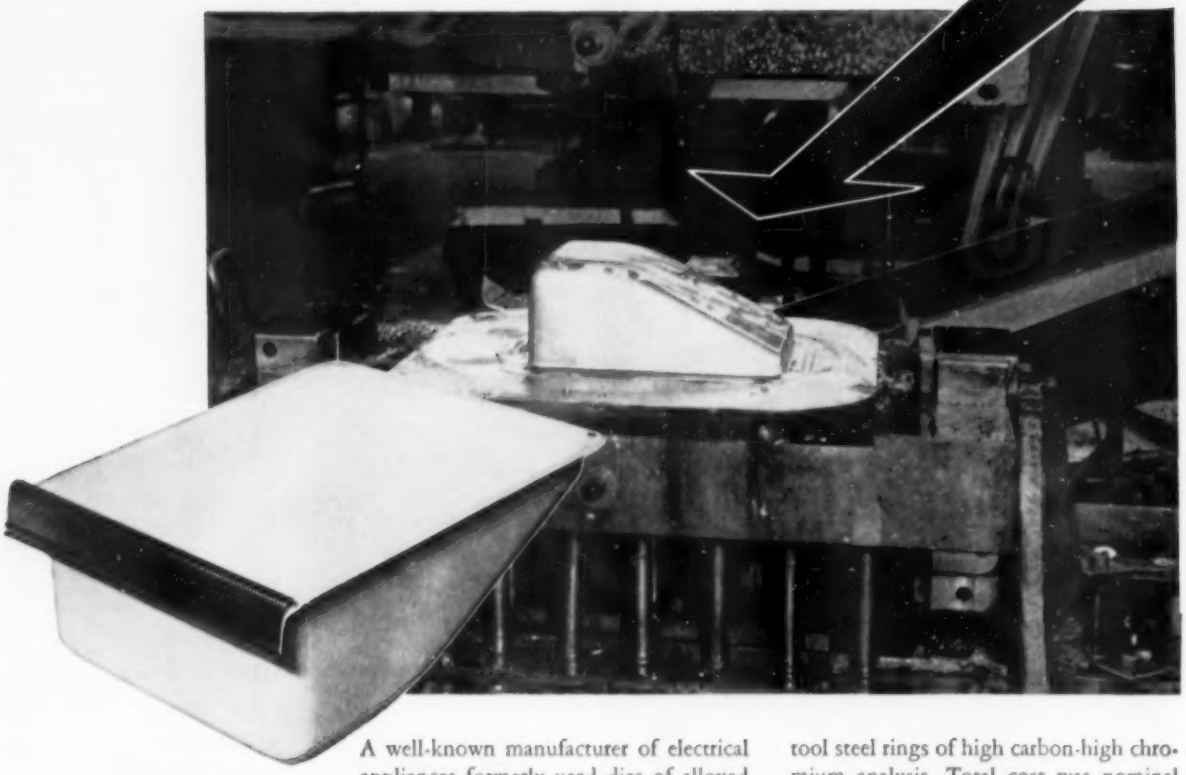

A well-known manufacturer of electrical appliances formerly used dies of alloyed ductile iron castings to draw refrigerator crisper pans.

These dies had to be redressed after every 10,000 pieces (approximate cost: $1300 each) and had to be replaced after every 30,000 pieces. 8 to 10% of the pans were scrapped due to defects.

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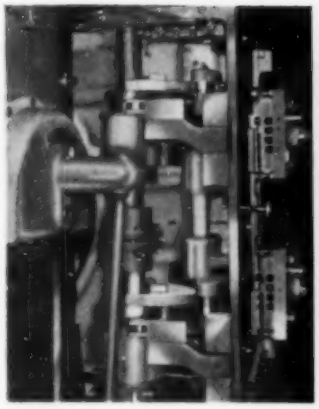

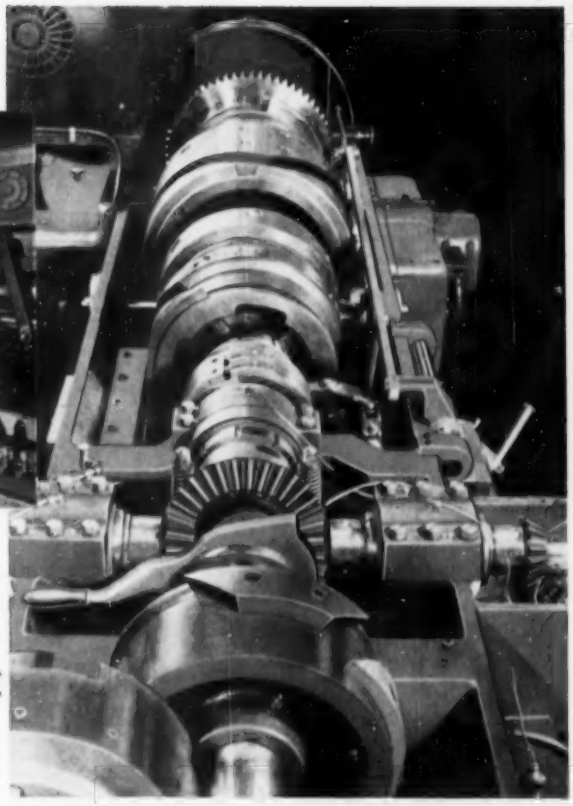

Conomatics Provide Radial Screw Adjustment of Forming Tool Slides

- Models 2⅝" LA, 3½" AD, 5" KL, and 5¼" KR Conomatic Four Spindle Bar Machines are equipped with a number of quick job-change features. One of these is the all-position end attachment drive for the mounting of endworking opposed spindles in all positions, with independent feed to as many as three opposed spindles on a single setup.

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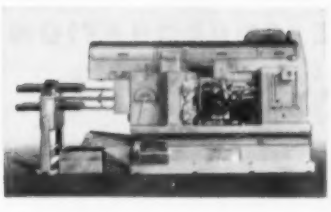
  All Conomatic quick changeover models are equipped with dial adjustment of the working stroke of all tool carrying slides. Besides the Four Spindle machines there are three quick change Six Spindle models in 9/16", 1" and 1⅝" sizes. Write, wire, or phone for literature.



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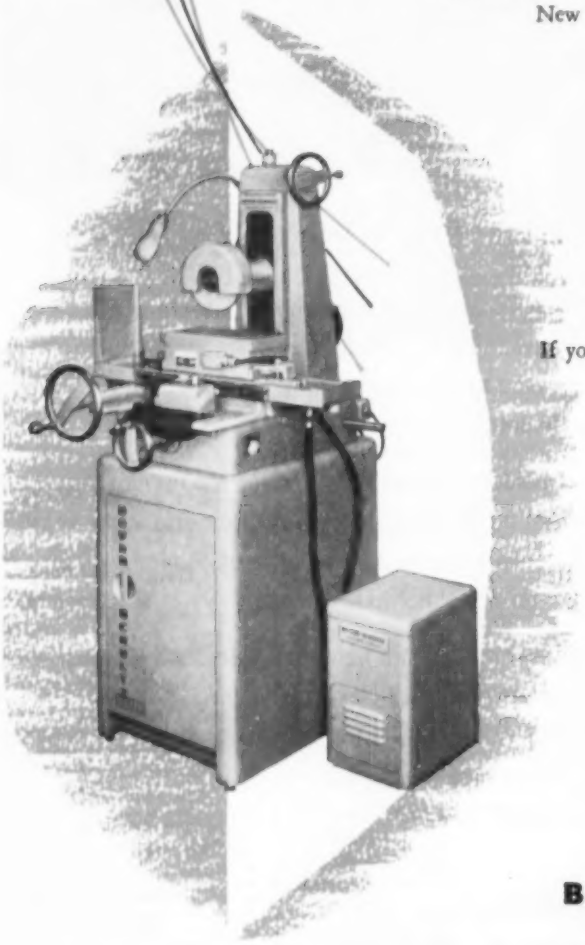
Mr. Bottie also states, "I might say that besides the savings we have received, we have had one full year with no breakdowns what-so-ever, not even a minor repair."



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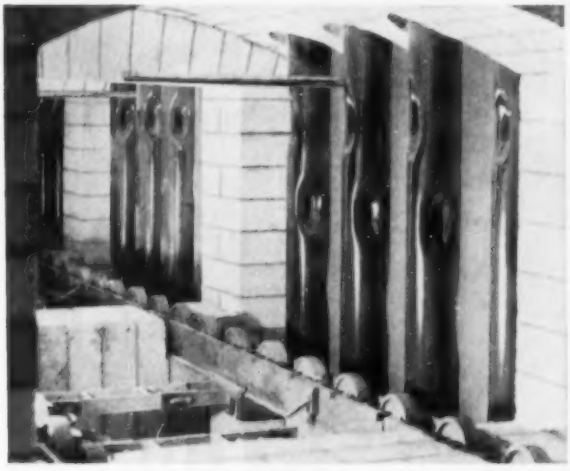

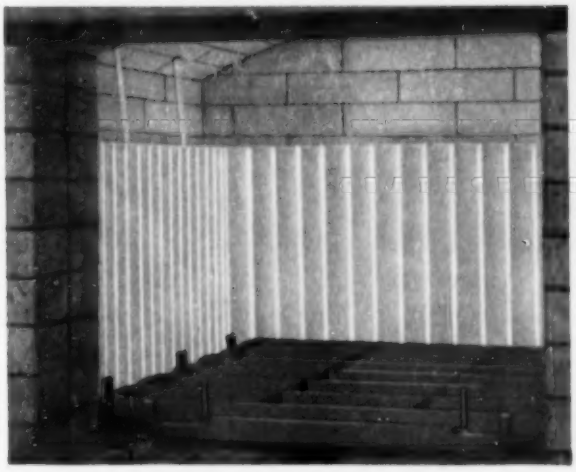

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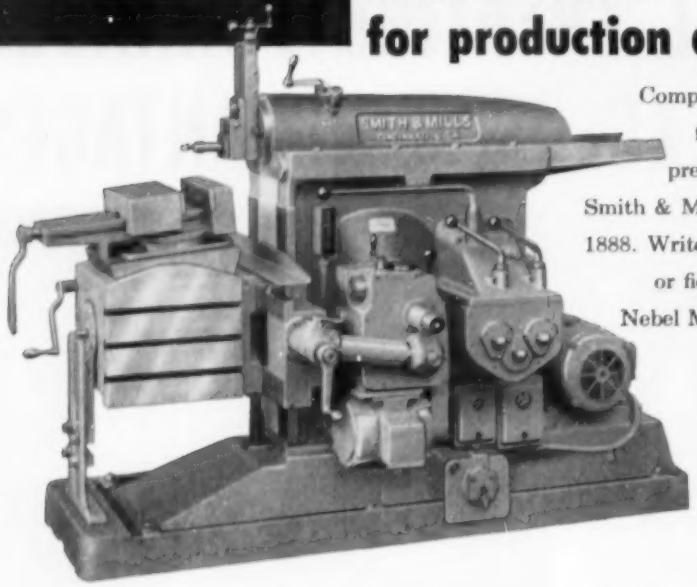
SHAPERS Smith & Mills for production and tool room



Compare Smith & Mills with any other shaper for versatility, speed, cutting power and precision performance. *Compare* and you'll *buy* Smith & Mills—famous for high quality shapers since 1888. Write or wire for prices, deliveries, repair parts or field service. Smith & Mills Shaper Division, Nebel Machine Tool Corp., 3411 Central Parkway, Cincinnati 25, Ohio.

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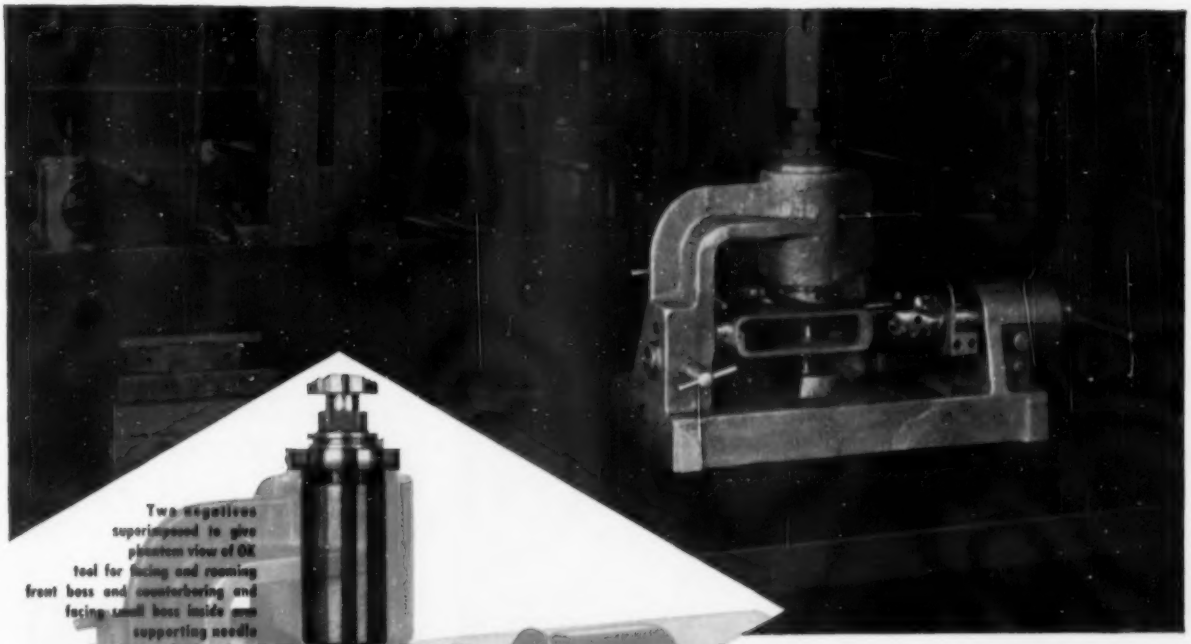
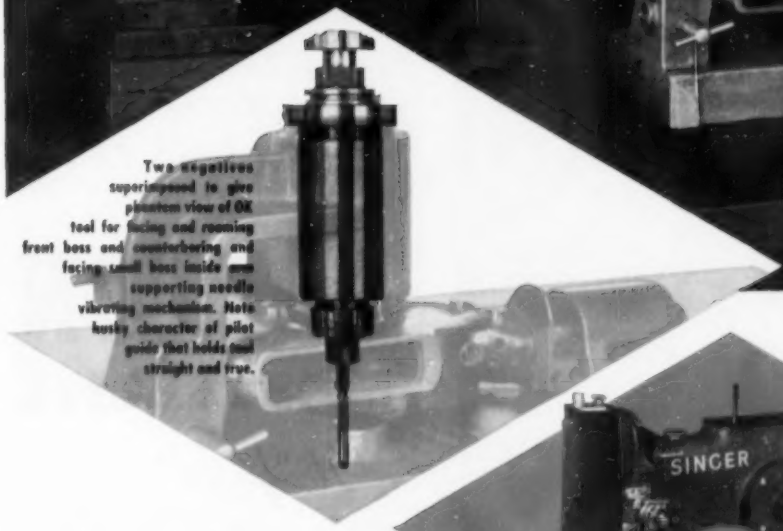
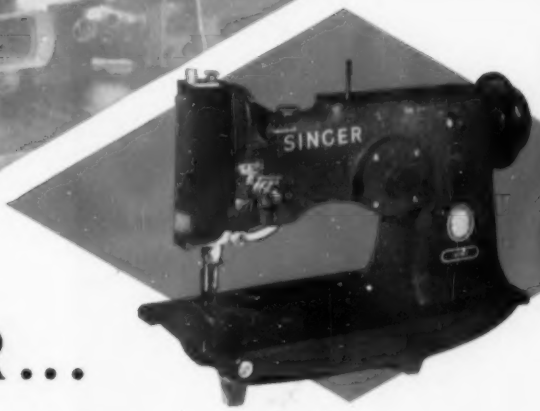




Two negatives superimposed to give phantom view of OK tool for facing and reaming front boss and counterboring and facing small boss inside arm supporting needle vibrating mechanism. Note husky character of pilot guide that holds tool straight and true.



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four operations with one stroke...

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Operating speed . . . 145 rpm

Feed . . . .013 feet per revolution

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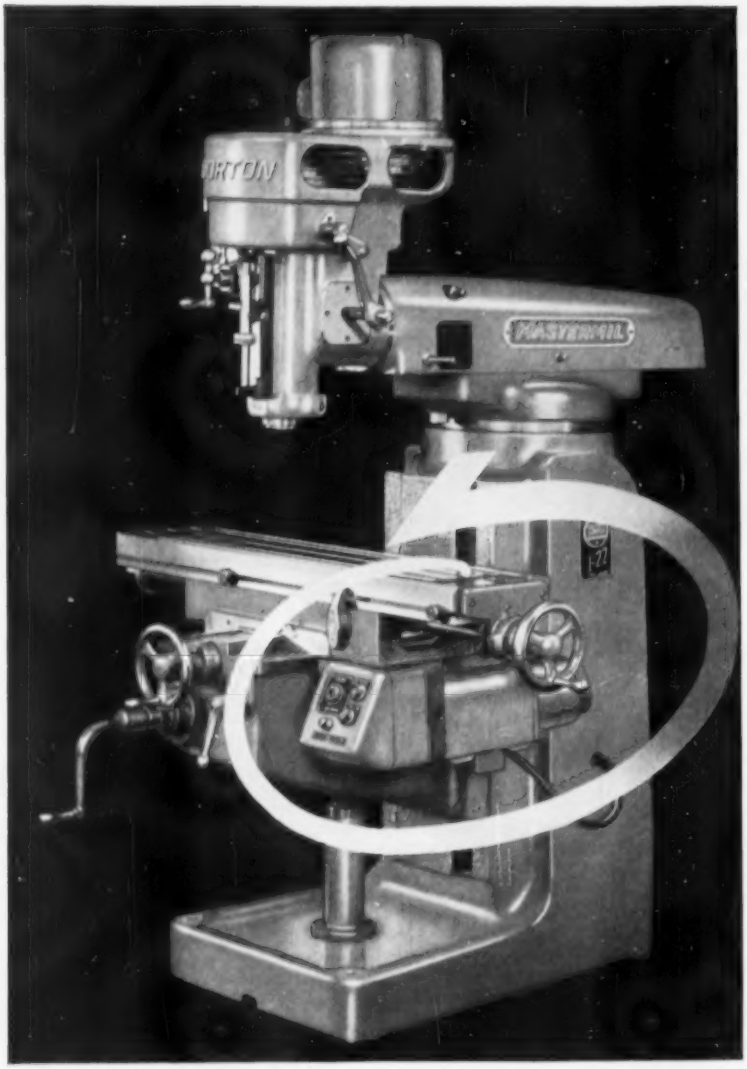

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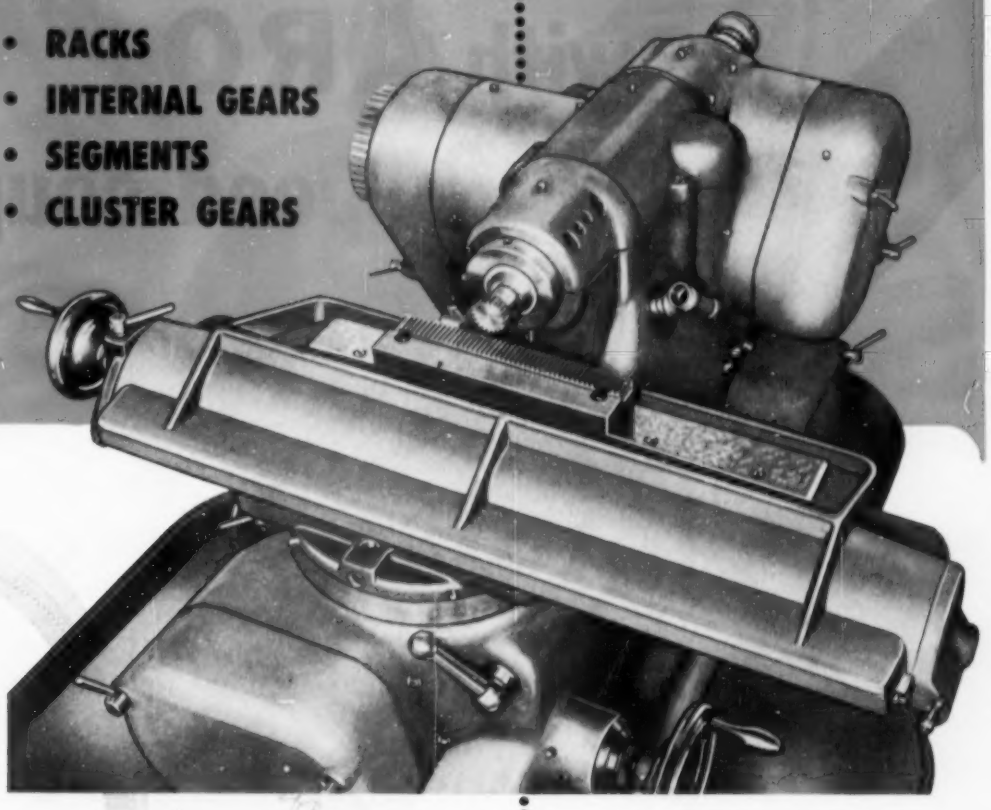

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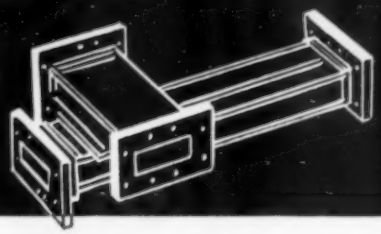

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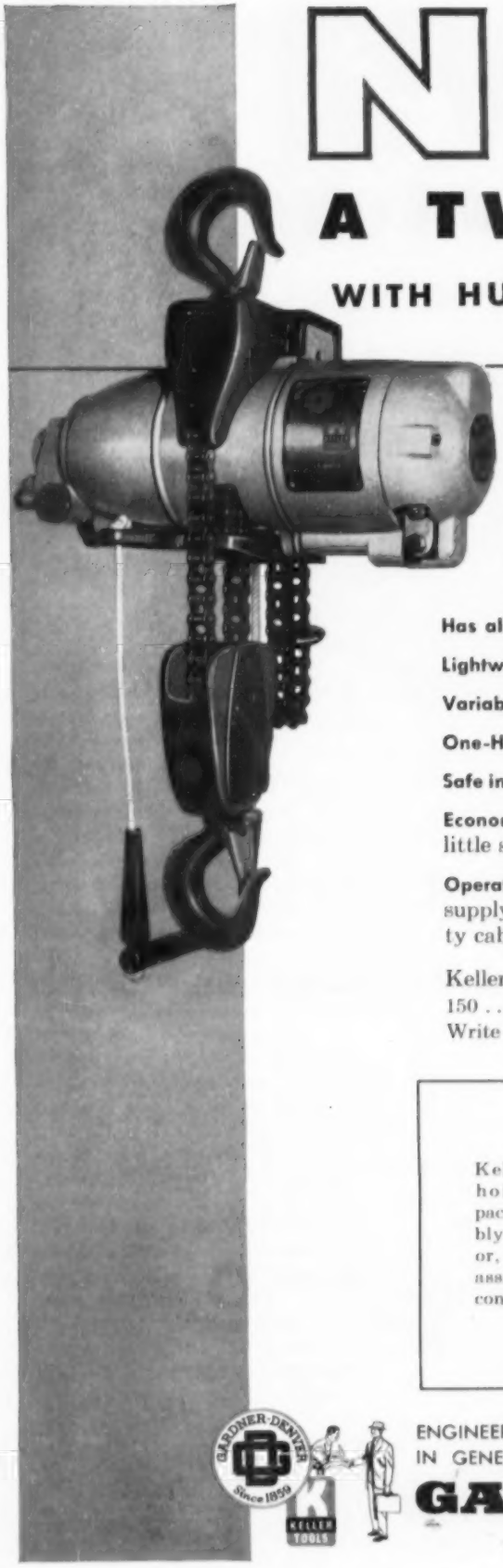

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WITH HUSKY 100-POUND AIR HOIST

New Keller Tool air hoist weighs 100 pounds . . . raises a 4000-pound load at 10 feet per minute. Hoist is strong and powerful enough to handle the 2-ton load with complete safety.

New 2-ton hoist is powered by high-torque, axial-piston compressed air motor for positive starts and stops. A centrifugally governed, fully mechanical brake prevents slippage. Length of lift is 8 feet. Hook-to-hook dimension is only 23½ inches.

Has all the outstanding features of the Keller Tool air hoist line:

Lightweight—easy to move and hang.

Variable Speed—from creep to maximum.

One-Hand Control—of lifting, lowering, spotting.

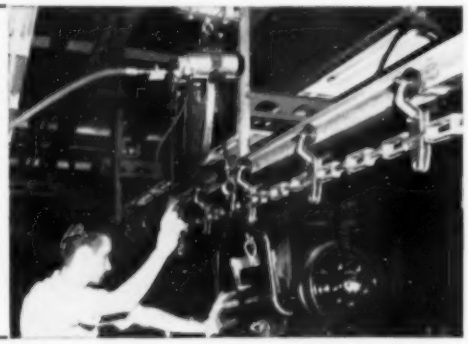
Safe in Heat or Dust—air motor doesn't spark . . . won't heat up.

Economical Operation—air consumption is low . . . requires little servicing or maintenance.

Operator Safety—powerful brake holds load regardless of air supply. An exclusive feature of the new two-ton hoist is a safety cable hole that provides extra safety for load and operator.

Keller Tool air hoists are available in lifting capacities of 150 . . . 300 . . . 500 . . . 1000 . . . 2000 . . . and *now* . . . 4000 pounds. Write for Bulletin 86.

Keller Tool air hoist, keeping pace with assembly line conveyor, lifts rear axle assemblies onto conveyor hooks.



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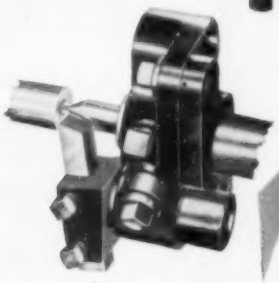
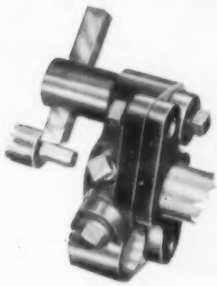
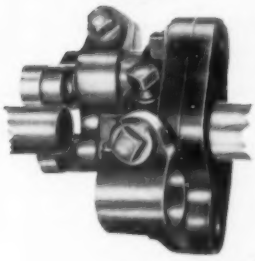
R and L TURNING TOOL

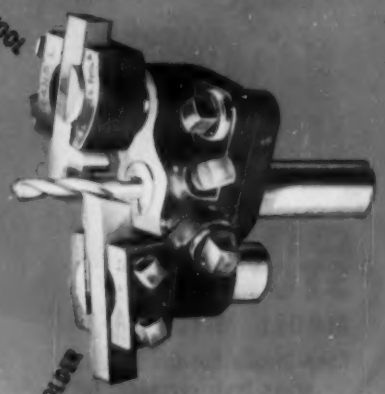
REPLACES AN ASSORTMENT OF 14 TOOLS!

The R and L Turning Tool can be changed from right to left in 10 seconds, and vice versa . . . It is guaranteed not to bend or give way in any manner.









R and L Turning Tool used as BALANCING TURNING TOOL

R and L Turning Tool used as CENTERING & FACING TOOL

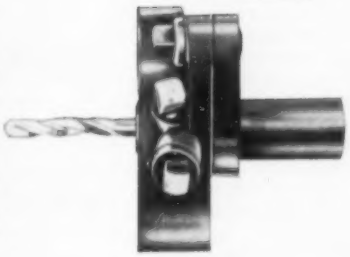
R and L Turning Tool used as KNEE TOOL

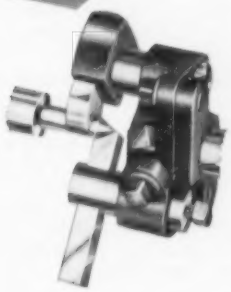
R and L Turning Tool used as BACK REST

R and L Turning Tool used as ROLLER BOX TOOL

R and L Turning Tool used as FLOATING DRILL HOLDER

R and L Turning Tool used as POINTING TOOL





YOU SAVE ON YOUR ORIGINAL INVESTMENT

Roller Box Tool	$77.00
Centering and Facing Tool	22.00
Knee Tool	37.00
Pointing Tool	36.00
Back Rest	29.00
Floating Drill Holder	14.00
Balancing Turning Tool	52.00
	$267.00
Same for left hand	$267.00
	$534.00

One R and L TURNING TOOL of a similar size (No. 1) costing only $96.50 will take the place of the above assortment of tools!

Write for complete catalog of R and L Tools

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Hold mill-like tolerances of ± .005" on

ANY METAL . . .

DAY IN, DAY OUT!

STONE

MODEL M-100

Chop-Stroke Cut-Off Machine gives fast, accurate, fully automatic cutting

Cuts any stock . . . in a wide range of shapes, lengths and diameters . . . any material, from aluminum to hardened tool steel. The M-100 will cut it swiftly, cleanly, accurately. Set-ups or resets are easily made. The M-100 cuts at a rate of 2 to 4 seconds per sq. in. cross sectional area . . . up to 5 times faster than comparable power cutting. Exclusive Stone geared-in-head motor delivers maximum power to the cutting edge. Greater speed of cutting produces no change of characteristics nor hardening of material cut.

The M-100 is powered by a 10 H.P. continuous duty, TEFC ball bearing induction type motor. Cuts ferrous metals with an abrasive wheel . . . nonferrous metals with a saw blade. It comes with fully automatic stock feed and automatic abrasive wheel wear compensator for faster, more accurate cutting without shut-down for adjustment.

The M-100 may be had for manual or semi-automatic operation. For greater power needs, a 15 H.P. motor is available.

WRITE TODAY for complete information on the MODEL M-100, and other cut-off machines by STONE. Sales and service in principal cities.

". . . represented in every major industry throughout the world."

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spring loaded live centers

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Spring loaded spindle maintains constant tail stock thrust.

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Needle bearing distributes bearing stress over greater surface, thus holding close tolerances for much longer time.

FASTER SPEEDS
Smaller turning radius gives much higher RPM rate than ordinary live centers.

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LESS OVERHANG MEANS MORE RIGIDITY . . . MORE WORKING RANGE

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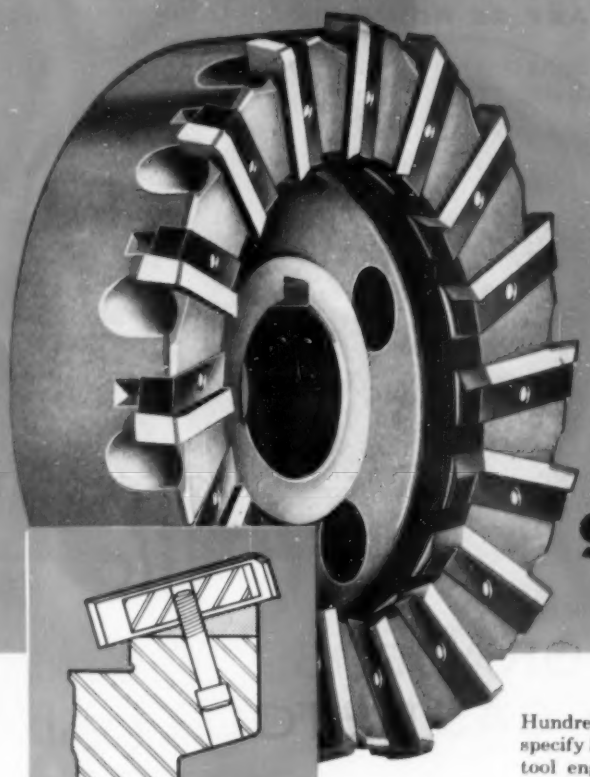
TO OBTAIN FURTHER INFORMATION ABOUT ADVERTISERS, TRADE LITERATURE OR TOOLS OF TODAY APPEARING IN THE ISSUE OF THE TOOL ENGINEER, USE THE HANDY READERS SERVICE CARD ON PAGE 169.

"10 YEARS ON THE JOB and our Super SOLID CARBIDE cutter's still going strong"



SUPER IBH CUTTER

For aluminum, steel, most other metals. All the features of our HBH Cutter except

- Blades are at 10° positive angle to radius
- Number of blades is diameter +2.

For efficiency, select the correct grade of carbide for the metal, grind to the proper angle. Your Super IBH Standard Cutter will do the rest!

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Here's why: For high speed machining of cast iron, malleable iron or brass, our HPH cutter has big *solid* carbide blades for maximum strength and elimination of braze strains. Blades are set radially, the number being the diameter x 2. You sharpen with a minimum removal of carbide—not the 1/8" you lose with serrated-back blades—as Super blades can be moved a few thousandths or less at a sharpening. Then after scores of sharpenings, you use the carbide down to a stub because our wedge (with a filler-blade) gives you a locking area the complete length of the slot. The blade is solid as though part of the body itself since there are no back-up screws. If a wreck occurs—as it may in the best of shops—only the wedge is damaged or scrapped, not your cutter body. There are no threads in the body to strip as our wedges are tapped to take locking screws let in from the back.

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Why not write for our complete catalog of solid and carbide tipped tools and the name of our stocking distributor near you. Thousands of satisfied tool buyers *must* be right; we'd like to have you join them.

Super TOOL COMPANY

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WAREHOUSES CHICAGO • DETROIT • NEW YORK • LOS ANGELES

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to save your machining time and reduce waste

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Ampco Grade 18 Stock Bars are now labeled on one end, for convenience in stocking. Labels show I.D. and O.D. sizes to which bars finish.

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Purchasing Simplified! Stated sizes are now the sizes to which bars will finish.

New Convenience! Finish allowance, 1/10" on the diameter, both O.D. and I.D. You need make only finish-machine cuts.

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Stock the sizes you ordinarily use in maintenance and tooling — and get other sizes promptly from your nearby Ampco stocking distributor.

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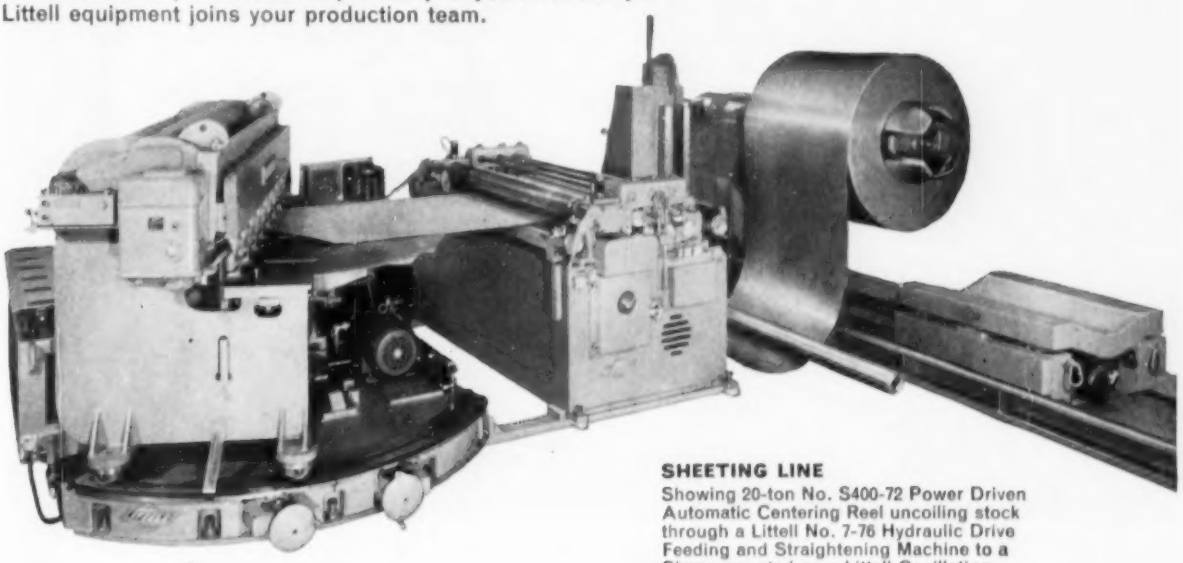
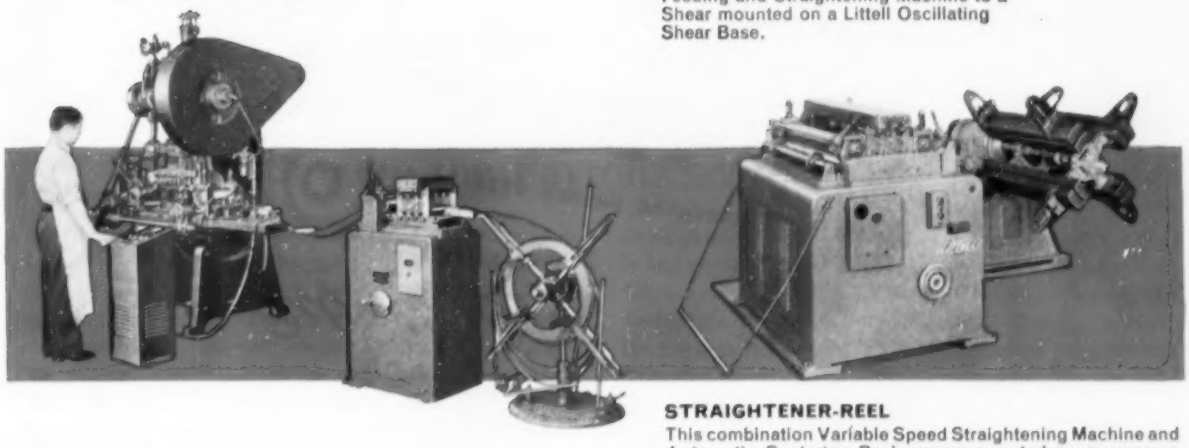
THE COMPLETE COIL HANDLING LINE

PERFORMANCE PROVED FOR 39 YEARS

Whether you use coil stock .010" thin, or .187" thick, Littell builds the straightener you need. Whether you require a reel of 300-pound or 40,000-pound capacity, Littell builds it. Not only is Littell the most complete line, it is the **only** line in the field with a service record that goes back 39 years, to the first coil stock. All this experience works profitably for you when today's Littell equipment joins your production team.



SHEETING LINE
Showing 20-ton No. S400-72 Power Driven Automatic Centering Reel uncoiling stock through a Littell No. 7-76 Hydraulic Drive Feeding and Straightening Machine to a Shear mounted on a Littell Oscillating Shear Base.



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Showing No. 3G Littell Motor Driven Automatic Centering Reel with 300 lb. coil capacity; No. 308 Littell Variable Speed, Power Driven Straightener; and Press equipped with Littell No. 3 Double Roll Feed.

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This combination Variable Speed Straightening Machine and Automatic Centering Reel comes mounted on a common base, pre-aligned. 7 Straightener Rolls, 2.25" x 38"; 2 Pinch Rolls, 4.25" x 38". 5 h.p., 4 to 1 Variable Speed Drive provides any speed from 225" to 900" per minute. Electric Brake Reel handles 6,000 lbs. coils up to 36" wide. No. 436-7PD-S60.

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gives full details.
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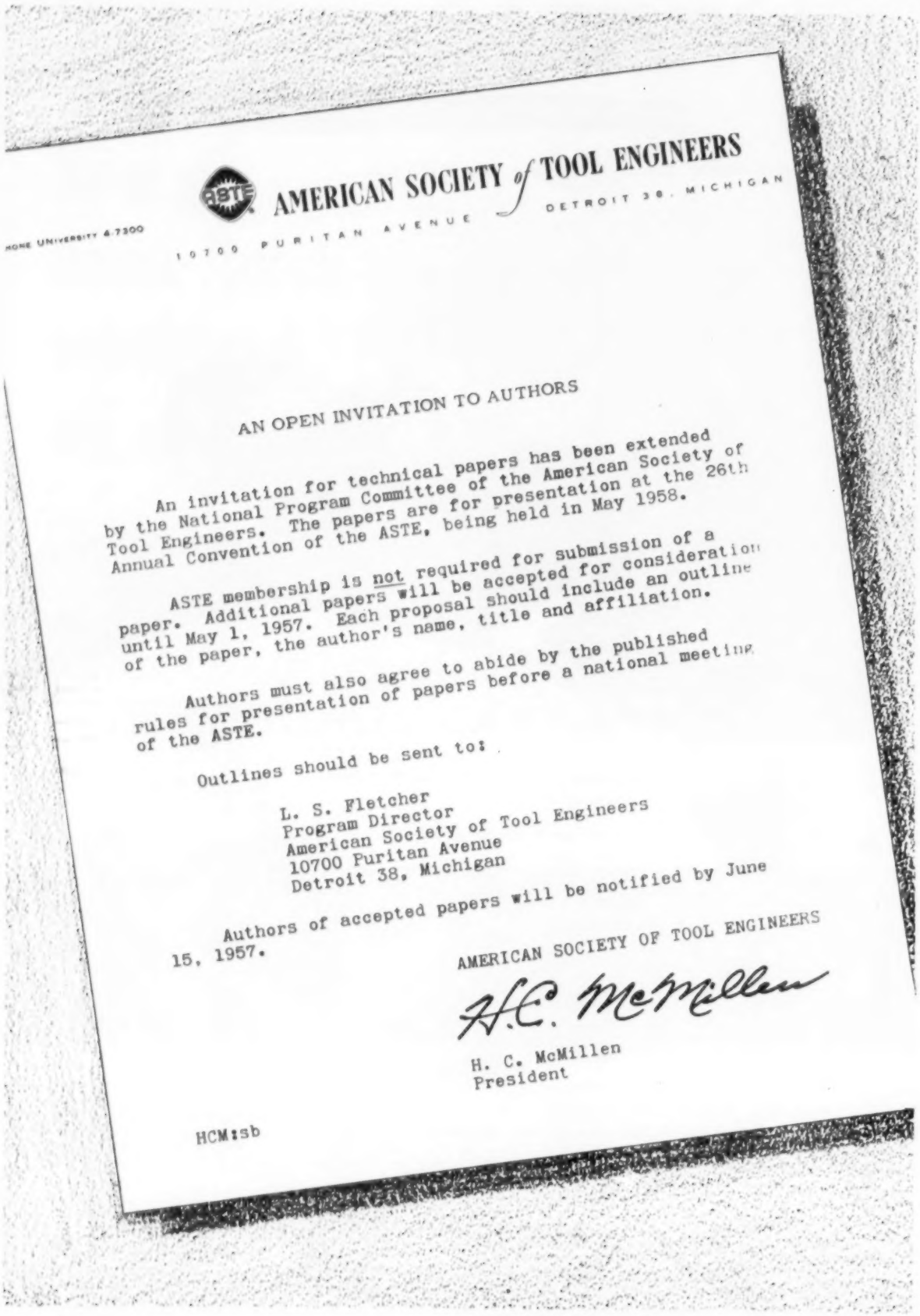

AMERICAN SOCIETY of TOOL ENGINEERS

10700 PURITAN AVENUE — DETROIT 38, MICHIGAN

MOHR UNIVERSITY 4-7300

AN OPEN INVITATION TO AUTHORS

An invitation for technical papers has been extended by the National Program Committee of the American Society of Tool Engineers. The papers are for presentation at the 26th Annual Convention of the ASTE, being held in May 1958.

ASTE membership is not required for submission of a paper. Additional papers will be accepted for consideration until May 1, 1957. Each proposal should include an outline of the paper, the author's name, title and affiliation.

Authors must also agree to abide by the published rules for presentation of papers before a national meeting of the ASTE.

Outlines should be sent to:

L. S. Fletcher
Program Director
American Society of Tool Engineers
10700 Puritan Avenue
Detroit 38, Michigan

Authors of accepted papers will be notified by June 15, 1957.

AMERICAN SOCIETY OF TOOL ENGINEERS

H. C. McMillen

H. C. McMillen
President

HCM:sb

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Portrait by Fabian Bachrach

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Precision of the order required originally in this double-duty die—to tolerances of 0.0002"—is not considered remarkable at Ehrhardt. This die was ready for delivery when the customer was offered an order for motors of the same size stator, but an entirely different design on the rotor—changing from the key hole slot to the tear drop slot—provided he could meet a 4 week delivery date.

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May 1957 Issue

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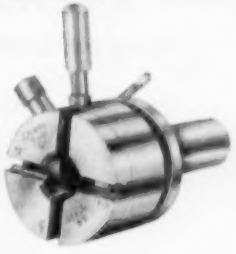

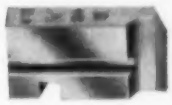

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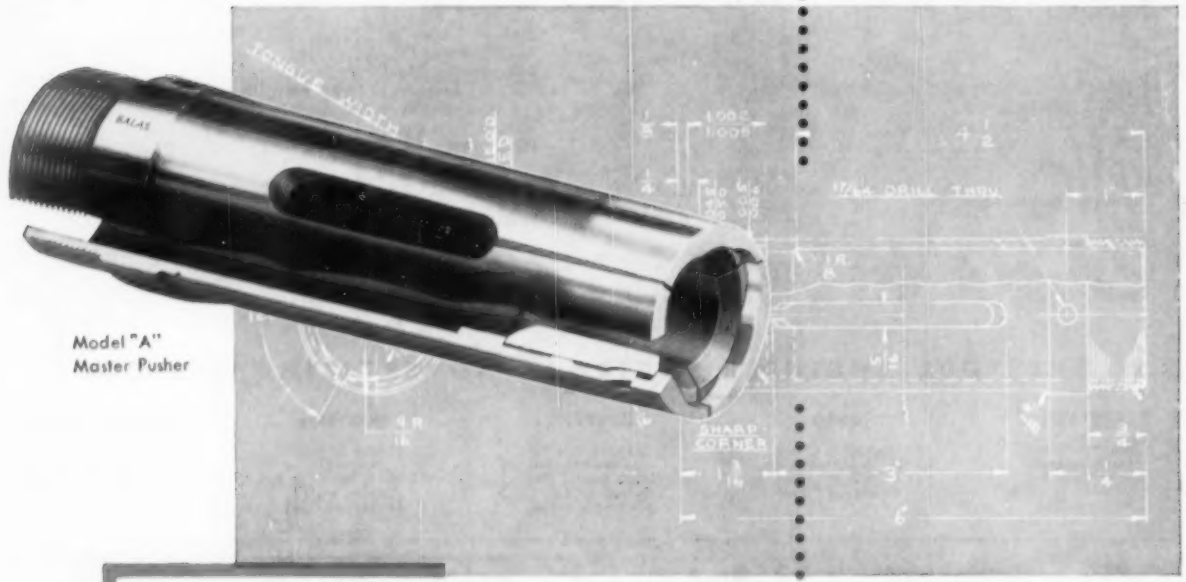

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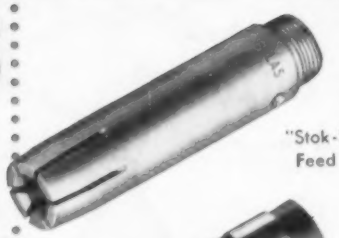

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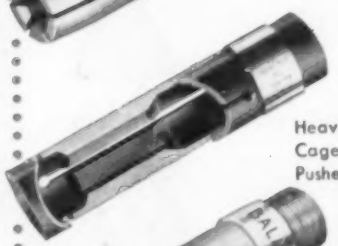

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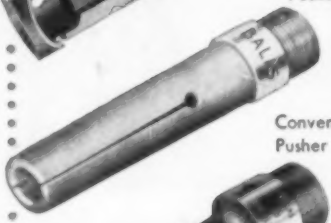

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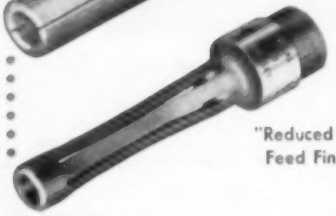

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